The International Journal of
Orthodontia, Oral Surgery and Radiography

VOL. XIII ST. LOUIS, NOVEMBER, 1927 No. 11

ORIGINAL ARTICLES

THE FACE AND OCCLUSION OF THE TEETH IN MAN*

BY MILO HELLMAN, D.D.S., NEW YORK CITY
Research Associate in Physical Anthropology, American Museum of Natural History, New York.

INTRODUCTION

AT THE First International Orthodontic Congress, held in New York, last August, I had the privilege of presenting a paper on development as it affects the human face. The facts brought out in that paper supported the view that in its transition from infancy to senility, the face goes through several stages of development which once attained become characteristic for certain periods of life. These developmental stages are brought about by increases in size, changes in proportion, and modifications in form. The increase in size occurs in three dimensions; i.e., when the face grows larger it increases in height, in width, and in depth. The changes in proportion take place when the various dimensions increase at diffeernt rates of speed; i.e., when the ratio of one dimension to another of the same structure changes. The modification in form occurs when these changes become effective in the structure as a whole; i.e., when the entire structure undergoes a change in contour, a change in pattern or a change in position.

GROWTH OF THE FACE

Thus, it is found that as the face increases in height, there are actual increments in all the skeletal structures composing it. But, at the same time, the dentition developing between the upper and lower portions of the face pushes them apart, as it were, thereby bringing about an additional increase in the total dimension in height. The increase in width also takes place in a similar way. As the face grows wider, it does so by spreading out laterally. But as this spreading takes place, there is a greater increase posteriorly, and this is more accentuated below in the region of the mandibular angle (go-

*Read at the Twenty-sixth Annual Meeting of the American Society of Orthodontists, Chicago, May 2, 1927.

nion). The depth of the face is acquired by increments from behind; i.e., when the face increases its dimensions anteroposteriorly, it really grows backward. But, as it does that, the entire facial mask swings, as it were, forward. This forward swing occurs at a greater rate below, in the chin region, than above, in the nasal region. These facts emphasize the point that as the face keeps on developing, different parts grow at different rates. The ultimate result is that all parts vary. Even the same part becomes unlike in different individuals and in the same individual at different periods of life and at the same period on the two sides when it is bilateral.

These facts were obtained by a study of the various structures composing the facial skeleton. The material used for that purpose consisted of a number of skulls of a homogeneous group of ancient American Indians, ranging in ages from infancy to senility. Although it would be of importance to preface my present contribution with a detailed account of the method of procedure in that study, it is readily understood that time will not permit. The foregoing remarks will have to suffice. Since the method of procedure used in that study was adequate enough to point out the important facts in relation to growth, it will undoubtedly prove of equal value in its application to the present problem. But, while in the former study it was used to bring out resemblances and differences in the faces of individuals of the same race but of different age groups, it is now used to point out resemblances and differences between like age groups but of different types. The age group selected is that of the adult. The types are of different racial groups and of different occlusal conditions.

METHOD USED IN THIS STUDY

This study was pursued by the use of the quantitative method employed largely in anthropology. That is, measurements were taken of like facial structures of skulls of different individuals and of different groups of individuals. The measurements were grouped according to their distribution, and calculations made to determine the *mean* or *average* and the *standard deviation.* The *mean* and *standard deviation* are then used for comparisons to determine resemblances or differences. The structures measured are enumerated in the first column of Tables I, II, III, IV, and V. As shown in these tables the measurements are divisible into five different categories, as follows:

MEASUREMENTS

OF HEIGHT	OF WIDTH	OF DEPTH	OF ANGLES	OF POSITION
Total face	Bizygomatic	Total Palate	Facial	Aur. Nasion
Upper face	Bimalar	Ant. Palate	Alveolar, Upper	Aur. Pros. Sup.
Lower face	Bicanine Upper	(to suture)	Gonial	Aur Pros. Inf.
(or symphysial)	Bicanine Lower	Post. Palate	Mental	Aur. Menton
Dental	Max. Alv. Arch Upper	(from suture)	Canine	
Nasal	Max. Alv. Arch Lower	Alveolo-Ramus		
Subnasal	Nasal	Pre Ramus		
Palate	Post. Nares	Ramus		
Post Nares	Interorbital	Basal (Mandible)		
M. Region	Palate Maximum	Alv. Arch Upper		
(of mandible)	Palate Minimum	Alv. Arch Lower		
Condylar	Bicondylar	Cond.-Cor. Dist.		
Coronoid	Bigonial			
Sig. Notch				

There are, thus, measurements of 44 different features used as specific characters in this study.

The assumption I first started out with was that if, as is generally accepted, the occlusion of the teeth affects the structures of the face, then the facial characters studied should have a definite relationship to the occlusion of the teeth. I thought that by finding this relationship to be present, the basis now used to classify occlusal abnormalities will be confirmed and verified. Whether I succeed in this attempt will be realized after the evidence brought before you is more fully examined.

TESTING THE METHOD OF PROCEDURE

Before attacking the problem of occlusion, I thought it advisable to put the method of procedure to test. For this purpose I made several series of measurements of the faces of two contrasting racial groups. The Hindu and the Australian aboriginal, having many contrasting facial features, were used in this test. Tables I, II, III, IV, and V give a detailed account of the differences in facial structure of these two races. Of course, it is generally

TABLE I

SHOWING COMPARISONS IN HEIGHT OF FACE IN THE HINDUS AND AUSTRALIANS

RACE	HINDUS			AUSTRALIANS		
HEIGHT	N.*	A.*	S.D.*	N.	A.	S.D.
Total	55	106.32	10.29	31	107.04	6.87
Upper	56	63.00	5.80	36	65.09	4.56
Lower	56	29.09	4.26	32	30.44	2.36
Dental	38	15.74	2.93	29	14.07	3.34
Nasal	55	47.82	3.32	36	47.78	3.49
Subnasal	56	15.30	3.93	36	17.91	4.59
Palate	56	12.95	2.73	34	13.56	2.08
Post. Nares	56	25.25	2.29	34	26.50	2.48
M. Region	56	25.52	2.97	32	26.69	2.65
Condylar	54	56.81	5.94	31	61.57	4.74
Coronoid	56	59.38	6.99	30	61.19	5.75
Sig. Notch	56	13.04	2.33	29	11.10	1.79

*N = Number; A = Average or mean; $S.D.$ = Standard deviation. These designations are implied in all the tables marked in the same manner.

TABLE II

SHOWING COMPARISONS IN WIDTH OF FACE OF THE HINDUS AND AUSTRALIANS

RACE	HINDUS			AUSTRALIANS		
WIDTH	N.	A.	S.D.	N.	A.	S.D.
Bigygo.	56	121.52	6.99	36	126.51	6.18
Bimalar	56	93.16	5.49	36	94.49	6.51
Bicanine, Upper	56	36.75	3.03	36	39.86	2.65
Bicanine, Lower	55	31.33	2.45	32	34.53	1.75
Max. Alv. Arch Upper	53	59.53	4.25	36	63.25	4.21
Max. Alv. Arch Lower	52	64.96	3.42	32	65.97	2.49
Nasal	55	24.25	2.23	36	27.69	2.09
Post. Nares	56	29.03	2.43	35	28.06	1.88
Interorb.	54	21.11	2.30	32	22.50	1.89
Palate Max.	56	38.45	3.25	36	40.03	2.82
Palate Min.	53	23.70	2.26	36	26.03	2.07
Bicondylar	56	109.39	8.40	30	111.39	5.85
Bigonial	56	92.54	7.92	31	91.17	5.94

TABLE III

SHOWING COMPARISONS IN DEPTH OF FACE OF THE HINDUS AND AUSTRALIANS

RACE		HINDUS			AUSTRALIANS	
DEPTH	N.	A.	S.D.	N.	N.	S.D.
Total Palate	56	46.11	3.06	34	52.85	2.55
Ant. Palate	55	35.24	2.91	32	40.62	2.88
Post. Palate	55	11.13	3.34	32	12.25	2.28
Alv. Ramus	53	76.87	4.62	30	86.97	3.96
Pre. Ramus	54	46.67	3.78	30	54.27	3.32
Ramus	53	30.66	2.49	32	33.22	2.07
Basal	55	70.89	5.03	31	79.05	4.53
Alv. Arch, Up'r	52	49.10	4.05	36	52.42	3.08
Alv. Arch, L'er	51	48.73	4.27	32	53.31	3.06
Cond. Cor. Dist.	56	33.11	4.71	29	36.34	3.59

TABLE IV

SHOWING COMPARISONS IN ANGLES OF FACE OF THE HINDUS AND AUSTRALIANS

RACE		HINDUS			AUSTRALIANS	
ANGLE	N.	A.	S.D.	N.	A.	S.D.
Facial	56	84.19	3.21	36	78.28	2.74
Alveolar	56	58.15	6.90	36	52.07	8.10
Gonial	56	120.48	7.47	32	115.57	6.03
Mental	53	63.02	7.20	32	77.07	6.96
Canine	53	71.75	4.89	35	63.54	4.08

TABLE V

SHOWING COMPARISONS IN POSITION OF FACE OF THE HINDUS AND AUSTRALIANS

RACE		HINDUS			AUSTRALIANS	
POSITION	N.	A.	S.D.	N.	A.	S.D.
Aur. Nasion	54	87.34	5.16	36	88.82	3.93
Aur. Pros. Sup.	54	93.84	5.19	36	101.89	4.32
Aur. Pros. Inf.	53	97.10	5.79	31	107.73	4.65
Aur. Menton	51	107.01	7.05	31	117.65	4.74

known that the faces of the Hindus and those of the Australian aboriginals are markedly different. But the *particulars* in which they differ most have not been pointed out so distinctly as may be seen by the characters studied. Thus, in height there is little difference between the two. But whatever difference there is may be noticed in specific instances. For example, the ramus of the mandible is considerably higher in the Australians than in the Hindus. The sigmoid notch, however, is deeper in the latter, showing that although the ramus is lower, the condyle and coronoid processes are higher in the Hindus. The dental height is greater in the Hindus, while the subnasal height is greater in the Australians, showing that the Australians have a higher upper alveolar process than do the Hindus. In the latter, the border of the alveolar process is considerably receded, giving a greater dental height.

In width, the Australians exceed the Hindus in all but two instances. These two are the widths at the posterior nares and at the mandibular angle (gonial width), and in these the Hindus exceed the Australian Aboriginals only by one and 1.5 mm., respectively, on the average. It is rather curious to note that the posterior nares is wider in the Hindus, despite the fact that the anterior nasal aperture is wider in the Australians.

The comparisons in depth present the real contrasting features. Thus, the alveoloramus depth (the distance from the alveolar process between the lower central incisor to the posterior border of the rami in the sagittal plane) of the Australian exceeds that of the Hindu by 10 mm., the basal depth (length of the body of the mandible) by 8.16 mm., the palate (palate length) by 6.75 mm., and the lower alveolar arch depth (length) by 4.58 mm. Also in position of the face, the Australians contrast markedly with the Hindus. Thus, while at the upper end of the face there is not much difference in the position of either, the upper prosthion, the lower prosthion and the menton are placed considerably more forward in the Australian than in the Hindu. On account of this forward position of the Australian face the angles contrast markedly. Thus the facial, alveolar, gonial and canine angles are all more acute. The mandibular (gonial) angle is more obtuse in

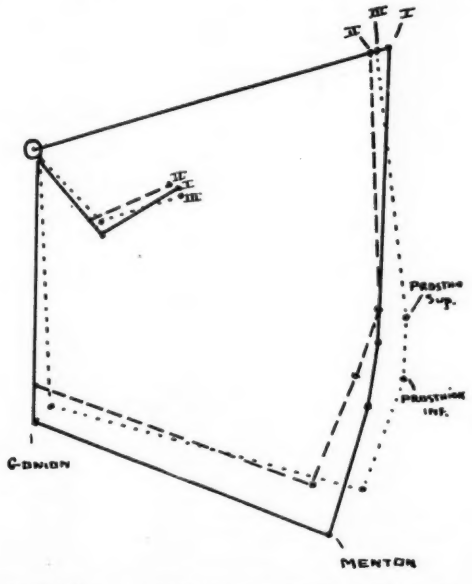


Fig. 1.—Diagrammatic presentation of profiles of faces. Solid line (I) indicates profiles of Whites; broken line (II) is profile of Hindu; and dotted line (III) profile of Australian.

the Hindus, not so much because of position of the face, but rather because the entire mandible is relatively small. This is a rather characteristic and general occurrence. The smaller a mandible is, the more obtuse the mandibular angle (gonion) will be. The mental angle, on the other hand, is more obtuse in the Australians because the chin is less prominent than in the Hindus. Fig. 1 presents diagrammatically this contrast. This diagram presenting the profile of the faces of the Hindu and Australian was worked out from the averages of some of the measurements with the purpose in view of visualizing the contrast between these two races. The third profile is that of the white male. It is just put there to show that it differs from both the Australian and the Hindu. It may be noted that while the position of the face of the Australian is forward to that of the White, that of the Hindu is in back of it. It can thus be seen that by this method it is quite possible to point out such fundamental differences and resemblances in facial features as have a significant bearing on characteristics typifying a race.

The results of the first test being rather gratifying, I put the method to a further test. I was interested to know whether a like procedure would reveal the differences and resemblances in the faces of the two sexes of the same race. For this purpose, I used a group of skulls of Whites of the 12th century from Hungary. The skulls are part of the great von Luschan collection

TABLE VI

SHOWING COMPARISONS IN HEIGHT OF FACE IN MALES AND FEMALES OF WHITES, DEMKO-HEGY, HUNGARY, 12TH CENTURY

SEX	MALES			FEMALES			CL. III.	CL. III.
HEIGHT	N.	A.	S.D.	N.	A.	S.D.	♂	♀
Total	23	117.74	5.76	16	107.87	4.63	114	–103
Upper	22	71.41	3.28	16	64.56	2.93	74	64
Lower	23	33.48	3.08	16	29.44	2.52	–27	28
Dental	23	14.30	2.34	16	14.37	2.18	13	12
Nasal	23	50.74	2.88	16	46.94	2.54	52	46
Subnasal	22	20.55	2.59	16	17.62	2.18	22	18
Palate	21	13.57	2.91	16	12.06	2.84	13	13
Post. Nares	22	27.64	2.01	15	26.19	1.63	–	–22
M. Region	23	29.52	3.34	16	26.19	2.33	27	23
Condylar	22	62.27	5.40	15	55.20	3.76	62	52
Coronoid	20	64.30	5.83	16	54.50	3.14	67	–51
Sig Notch	21	12.48	1.30	15	11.13	1.26	+14	11

TABLE VII

SHOWING COMPARISON IN WIDTH OF FACE IN MALES AND FEMALES OF WHITES, DEMKO-HEGY, HUNGARY 12TH CENTURY

SEX	MALES			FEMALES			CL. III.	CL. III.
Widths	N.	A.	S.D.	N.	A.	S.D.	♂	♀
Bizygo.	22	131.59	6.77	16	122.94	3.90	133	124
Bimalar	22	95.18	5.57	16	91.06	3.31	94	91
Bicanine Upper	23	39.65	2.97	16	36.06	2.36	–36	35
Bicanine Lower	23	34.13	2.13	15	32.27	1.61	–31	+34
Max. Alv. Arch Upper	23	63.86	3.86	16	61.31	3.25	–60	64
Max. Alv. Arch Lower	23	66.52	3.63	15	65.00	3.52	64	+69
Nasal	23	25.70	1.73	16	24.75	1.44	–23	–22
Post. Nares	22	29.91	2.69	14	29.79	1.82	—	–22
Interorb.	23	23.78	1.81	16	23.31	1.83	24	–20
Palate Max.	23	41.61	3.03	16	40.69	2.59	41	42
Palate Min.	23	25.96	2.24	16	24.44	1.27	–23	+27
Bicondylar	22	117.86	7.33	15	111.27	6.54	117	111
Bigonial	22	101.09	9.30	15	92.40	6.10	98	92

TABLE VIII

SHOWING COMPARISONS IN DEPTH OF FACE IN MALES AND FEMALES OF WHITES, DEMKO-HEGY, HUNGARY, 12TH CENTURY

SEX	MALES			FEMALES			CL. III.	CL. III.
Depth	N.	A.	S.D.	N.	A.	S.D.	♂	♀
Total Palate	23	48.74	2.86	16	45.06	2.88	46	–42
Ant. Palate	23	37.96	3.10	16	35.31	2.61	38	–31
Post Palate	23	10.87	2.69	16	9.75	2.51	– 8	11
Alv. Ramus	23	80.74	3.79	16	76.63	3.59	–73	77
Pre. Ramus	23	47.96	2.51	16	46.69	3.20	–45	46
Ramus	22	32.41	2.57	16	29.50	1.50	30	30
Basal	22	74.91	3.58	16	69.06	4.17	–70	73
Alv. Arch Upper	23	49.00	2.52	16	46.06	3.13	–47	44
Alv. Arch Lower	23	46.21	3.79	14	44.21	5.21	–35	+50
Cond. Cor. Dist.	20	35.55	2.63	16	32.31	2.64	36	+37

TABLE IX

SHOWING COMPARISONS IN ANGLES OF FACE OF MALES AND FEMALES OF WHITES, DEMKO-HEGY, HUNGARY, 12TH CENTURY

SEX	MALES			FEMALES			CL. III.	CL. III.
Angle	N.	A.	S.D.	N.	A.	S.D.	♂	♀
Facial	22	87.09	2.31	16	85.25	2.90	+90	86
Alv. Upper	22	69.73	5.06	16	66.69	5.84	+80	64
Gonial	20	121.30	5.42	16	127.06	5.06	121	129
Mental	23	63.13	5.80	16	61.06	6.52	60	58
Canine	22	77.14	4.07	16	74.56	4.08	80	74

TABLE X

SHOWING COMPARISONS IN POSITION OF FACE OF MALES AND FEMALES OF WHITES, DEMKO-HEGY, HUNGARY, 12TH CENTURY

SEX	MALES			FEMALES			III. CL.	III. CL.
Position	N.	A.	S.D.	N.	A.	S.D.	♂	♀
Aur. Nasion	22	91.59	3.88	16	85.00	3.71	–86	–81
Aur. Pros. Sup.	22	97.95	3.43	16	91.44	4.33	–89	–87
Aur. Pros. Inf.	22	102.64	4.66	16	96.81	4.57	98	98
Aur. Menton	22	115.91	6.67	16	108.12	4.58	110	109

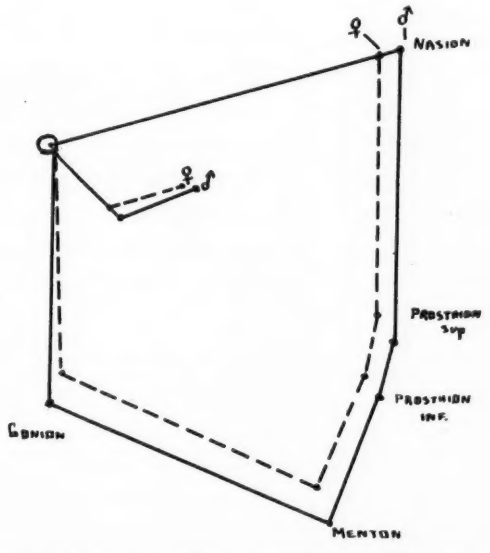


Fig. 2.—Diagrammatic presentation of profiles of Whites. Solid line (♂) indicates profile of males, broken line (♀) that of the females.

recently acquired by the American Museum. As is seen in Tables VI, VII, VIII, IX, and X, the female face differs in all but four dimensions, in three of which they are alike and in the fourth there is a reverse difference. The first instance in which they are alike is the dental height. In spite of the fact that all the male features are larger, the teeth appear to occupy a like vertical area in the female as they do in the male. The second and third resemblance is that found in the interorbital and posterior narial width. These are all interesting resemblances, because they include the structures associated with the functions of mastication, respiration, and vision. The reverse difference is found in the mandibular angle. The angle in the female mandible is more obtuse than

that of the male. Here again, as in the case of the Hindu, the peculiarity becomes evident that as the mandible decreases in size, the angle becomes more obtuse. Fig. 2 shows graphically the difference in the profiles of the faces of the two sexes. It may be noted that owing to the general diminutive size of the female face, the diagram presenting it falls completely inside that of the male. Moreover, since the female face is smaller in all particulars, the outlines of the two are considerably parallel to each other, except in the ramus which swings more obliquely forward in the female to increase the angle.

THE PROBLEM OF OCCLUSION

Encouraged by the results of these two tests, I felt quite assured that the method of procedure is certainly workable and entirely reliable. I, therefore, proceeded with sufficient confidence to the task of the main problem. As the study of occlusion was the chief aim in view, it was necessary to select first a group of skulls of a uniform type, of the same approximate age with the full complement of teeth in normal occlusion. This was essential, because a "norm"—a yard stick—had to be established with which to measure any deviation from the normal in occlusion. The skull collection at the Hamann Museum, of the Western Reserve University Medical School, in charge of Dr. T. Wingate Todd, furnished the material needed. This is the only collection to my knowledge where the skeletal material is definitely dated and fully recorded. The age, sex, color, race and place of origin of the individuals whose skeletons are harbored there are known and their records kept on file, requiring no guesswork as is usually necessary, to form a fair estimate of skeletal material in other instances. I am greatly indebted to Dr. T. Wingate Todd for the privileges granted and courtesies shown me during my investigation there. The other skull material studied is at the American Museum of Natural History.

The material selected from the collection of W. R. U. consists of a group of 54 skulls of adult males. Among them were 34 with the full complement of teeth in normal occlusion. One had a Class II division 1, three had Class III and sixteen Class I malocclusion. The 34 skulls with their dentitions in normal occlusion were used for the normal series.

VARIATION OF THE FACES OF SKULLS WITH NORMAL OCCLUSION

Before I had gone very far with the study of these skulls, I became impressed with the fact that although their teeth were in normal occlusion, the facial skeletons presented many differences. Some of the differences were of such character as to rouse a certain degree of suspicion regarding their normality. Indeed, in some the facial skeleton showed many resemblances to those presenting various classes of malocclusion. The dentition, nevertheless, proved them to be normal in so far as occlusion was concerned. I am mentioning this, because the general tendency is to assume a skull with a normal dentition as being of a uniform—"normal"—type. When large numbers of skulls are examined, the aspect of this situation changes very materially. It would seem more proper to think that the face retains such per-

sistent characteristics as are not easily influenced by environmental changes. Occlusion, on the contrary, although phylogenetically persistent, does yield to such environmental influences as malnutrition and disease. On account of the nature of such conditions, we may expect to find various types of faces with dentitions in normal occlusion as well as with dentitions in abnormal

Fig. 3-*A*.

Fig. 3-*B*.

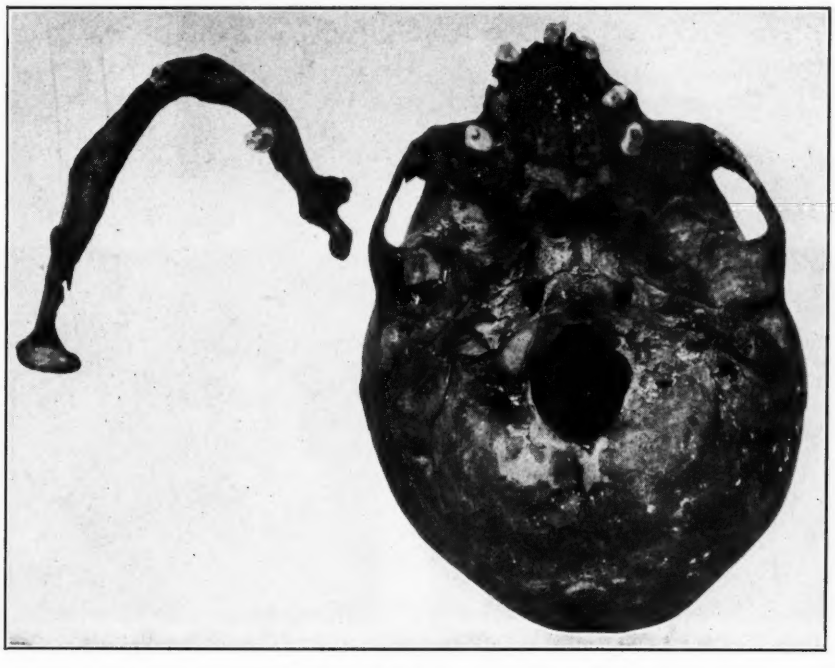


Fig. 3-*C*.

Fig. 3.—Photographs of skull (4606 von Luschan Am. Mus.), showing extreme asymmetry of mandible and face. *A*, Right side of skull showing abnormal proportions of body and ramus and posterior portion of the body of the mandible. *B*, Left side of skull showing normal proportions of body and ramus of mandible. *C*. Occlusal view of skull and mandible showing the contrasting features of the mandible and the adaptive distortion of the maxilla.

occlusion. The Hindu, for example, represents a type of face that closely resembles that with Class II, division 1, cases of malocclusion. And yet, the percentage of the dentitions in normal occlusion is very high. But, when they do show disturbances in occlusion, the tendency is to assume a

Class II, division 1, case. The Buriats of Central Mongolia, have faces and dentitions resembling closely Class II, division 2, cases. Among the adult Hungarian skulls of the 12th century, all malocclusion cases besides those having Class I, had Class III malocclusions. There is no Class II case found in that group. Among the living American children, Class II, division 1, seems to be very popular. It is, therefore, very apparent that in dealing

Fig. 4-*A*.

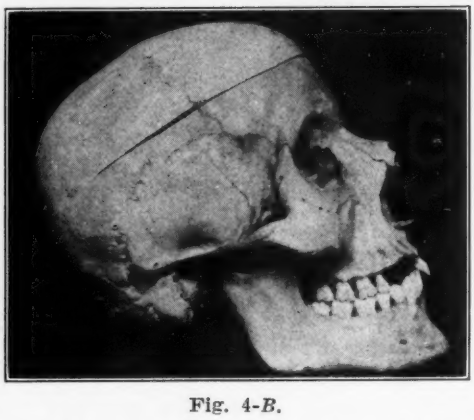


Fig. 4-*B*.

Fig. 4-*C*.

Fig. 4.—Photographs of skull (1/1378, Am. Mus.) showing asymmetry of dental arch. *A*, Occlusal view of skull showing anterior position of upper teeth on the right side. Compare position of upper molars in relation to the malar bones. *B*, Right side view, teeth in occlusion. Notice that the occlusal relationship is *not distal of the lower,* but *mesial of the upper.* In *A* the right side of the dental arch is seen further forward than the left. *C*, Left side view, teeth in occlusion. Notice the teeth are in normal occlusion. In *A* the teeth on this side are further back than on the other side.

with occlusion, the problem becomes so much more complex when the face is taken into consideration, than is as yet generally realized.

The lack of recognition of types reminds me of the physician, who after treating a patient ten years for yellow jaundice, discovers that the patient

is a Chinese. On account of this diversity in type we are to expect a wide range of variability of the various features concerned in the composition of the face, even when the dentition is in normal occlusion and when the group belongs to the same race. The fact to be remembered is that development is not a uniform and continuous process. It is limited by spatial and temporal barriers. Not only do some structures grow faster than others in the course of development, but also the same structure speeds up and slows down the rate at which it grows at different periods of life. These accelerations and retardations have a different effect on different individuals, on different structures of the same individual and even on different parts of the same structure. Just observe the two rami of the mandible in Fig. 3—*A*, *B* and *C*. Notice the extreme contrast in size. Of course, this is an unusual occurrence. But even under usual conditions the rami are not exactly alike. Also notice

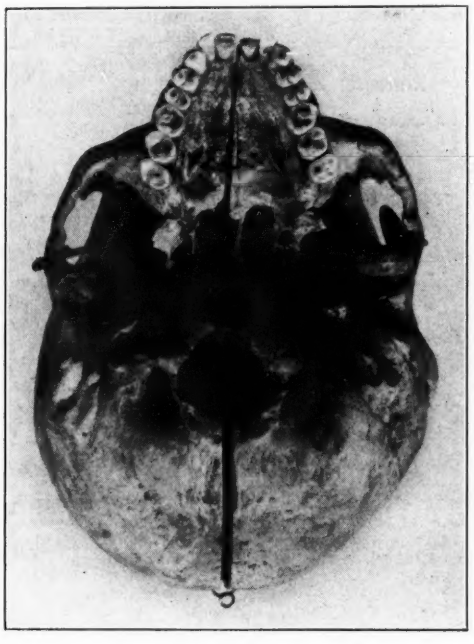


Fig. 5.—Photograph (occlusal view) of skull (794 W. R. U.), showing asymmetry of malar process of maxilla, malar bone, and zygomatic arch.

in Fig. 4-*A* how one side of the dental arch has grown noticeably more forward than the other side. Of course, in these two instances the situation has gone far beyond the limits considered as normal. But, even normal development may give rise to noticeable asymmetries. Fig. 5 presents a face with considerable asymmetry although its dentition is in normal occlusion. It is, therefore, quite natural to expect a certain degree of variability of the features examined even in skulls of a closely related type with dentitions in normal occlusion. Variation is satisfactorily studied by the use of the biometric method. The extent to which any feature may vary is quantitatively denoted by the *Standard Deviation*. The *average* or *mean* and *standard deviation* of this normal series, therefore, furnish the *yard stick* for measuring like features of whatever is to be compared with the normal. (See Tables XI, XII, XIII, XIV, XV.)

COMPARISON OF SKULLS WITH DENTITION IN NORMAL OCCLUSION AND CLASS II, DIVISION 1, MALOCCLUSION

If a comparison is made of the measurement of a certain facial character of the normal series as represented by the mean and standard deviation with the measurement of a like feature of any skull with a decided case of malocclusion, many differences will at once appear. If, however, such differences only be chosen in which the abnormal exceeds the average plus or minus the range of variability of the normal, specific features will be revealed that have a direct bearing on the entire make-up of the abnormal.

Examine in Table XI the figures given for the different parts of the face measured in height. Note that of the figures in the column under the

TABLE XI

SHOWING COMPARISONS IN HEIGHT OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (W. R. U. WHITE MALES)

OCCLUSION	NORMAL			*(1075) CL. II. DIV. 1 S. ⌣+	(654) CL. III. (m) —	(1043) CL. III. —	(337) CL. III. ~
Height	N.*	A.	S.D.				
Total	34	121.12	6.78	–114	123	118	–105
Upper	34	72.18	4.13	72	75	–67	–57
Lower	34	33.44	3.88	–29	37	32	31
Dental	34	15.68	2.22	–13	–12	+19	+23
Nasal	34	51.50	3.43	54	54	50	–47
Subnasal	34	20.09	2.65	18	21	–17	–10
Palate	34	14.76	1.87	–11	15	14	+19
Post. Nares	34	29.50	2.32	28	–23	–27	–25
M. Region	34	28.82	3.17	–21	27	30	–21
Condylar	34	64.65	3.89	–56	+70	–55	–58
Coronoid	34	65.38	4.79	62	70	–56	–54
Sig. Notch	34	13.85	2.07	13	14	– 9	–11

*N.=Number of cases; A.=Average or mean; S.D.=Standard deviation, number in parentheses refers to number of specimen; S.= subdivision; ⌣=protrusion of upper teeth; ~=protrusion of lower teeth; —=edge-to-edge bite; ⌣+=protrusion of upper teeth and excessive overbite; (m)=mutilated. All similar notations in the succeeding tables are to be interpreted in the same way.

TABLE XII

SHOWING COMPARISON IN WIDTH OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (W. R. U. MALES)

OCCLUSION	NORMAL			(1075) CL. II. DIV. 1 S. ⌣+	(654) CL. III. (m) —	(1043) CL. III. —	(337) CL. III. ~
Width	N.	A.	S.D.				
Bizygo.	34	132.56	4.77	–123	–126	–123	–125
Bimalar	34	92.53	4.26	–85	–87	–88	–86
Bicanine Upper	34	38.35	2.18	–33	–32	37	–30
Bicanine Lower	34	33.76	1.95	–31	+36	+36	+40
Max. Alv. Arch Upper	34	62.33	3.45	–56	61	60	59
Max. Alv. Arch Lower	34	68.30	3.06	67	66	+73	+72
Nasal	34	24.06	1.57	–22	24	24	23
Post. Nares	34	31.21	2.50	–28	–28	30	30
Interorb.	34	24.38	2.35	25	–22	25	–21
Palate Max.	34	40.56	3.13	–36	–34	39	–34
Palate Min.	34	24.18	1.90	–18	–19	25	–20
Bicondylar	34	118.62	6.51	118	–110	–109	–100
Bigonial	34	102.53	6.73	–93	–92	102	96

caption Class II, division 1, many show differences from those in the column of the average for the normal. The signs + and –, however, indicate that the features marked are considerably outside the limit of the normal range of variability as is indicated by the standard deviation. If I were asked in what particular does the face of this Class II, division 1, differ from that of the normal, I would say that in total height, the Class II, division 1, face is below the normal. But, since the upper face is equal to the normal, it is due to the reduced lower face or symphysial height of the mandible. The dental height, the palate vault, the body of the mandible and the ramus in the region of the condyle are all below the normal in height. In width

TABLE XIII

SHOWING COMPARISONS IN DEPTH OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION (W. R. U. MALES)

OCCLUSION	NORMAL			(1075) CL. II. DIV. 1, S. ⌣ +	(654) CL. III. (m) —	(1043) CL. III. —	(337) CL. III. ~
Depth	N.	A.	S.D.				
Total Palate	34	46.91	3.37	45	44	44	–40
Ant. Palate	34	35.71	3.23	33	35	–31	–31
Post. Palate	34	11.15	2.72	13	9	13	9
Alv. Ramus.	34	80.79	4.29	–68	77	83	78
Pre. Ramus	34	49.32	2.78	–44	47	51	+53
Ramus	34	31.94	2.44	–24	30	31	–26
Basal	34	77.71	4.66	–67	77	80	+84
Alv. Arch Upper	34	48.26	3.43	47	46	46	–40
Alv. Arch Lower	34	48.53	3.99	45	46	51	49
Cond. Cor. Dist.	34	33.85	3.09	–30	–24	–30	–26

TABLE XIV

SHOWING COMPARISONS OF ANGLES OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (W. R. U. MALES)

OCCLUSION	NORMAL			(1075) CL. II. D. 1. S. ⌣ +	(654) CL. III. —	(1043) CL. III. —	(337) CL. III. ~
Angles	N.	A.	S.D.				
Facial	34	85.44	3.88	+94	+ 93	85	86
Alv. Upper	34	69.74	5.80	68	+ 83	–58	69
Gonial	34	123.24	5.99	125	–115	127	123
Mental	34	57.68	7.43	–45	54	–48	–34
Canine	34	75.21	3.73	+80	+ 79	+82	–63

TABLE XV

SHOWING COMPARISONS IN DIMENSION OF POSITION OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (W. R. U. MALES)

OCCLUSION	NORMAL			(1075) CL. II. 1 DIV.1, S. ⌣ +	(654) CL. III. (m) —	(1043) CL. III. —	(338) CL. III. ~
Position	N.	A.	S.D.				
Aur. Nasion	34	90.59	3.64	94	–86	87	– 84
Aur. Pros. Sup.	34	96.74	4.52	– 90	–85	–90	– 84
Aur. Pros. Inf.	34	103.09	4.40	– 92	–95	103	107
Aur. Menton	34	118.85	4.86	–108	114	120	+125

(Table XII), the Class II face is below the normal in all but three instances; and these are characteristically up to the normal. These are, the maximum lower alveolar arch, interorbital and bicondylar width. In depth (Table XIII) or anteroposterior dimension, the Class II, division 1, face resembles the normal in five features and in the other five it falls below. The features falling within the range of variability of the normal are the total, anterior

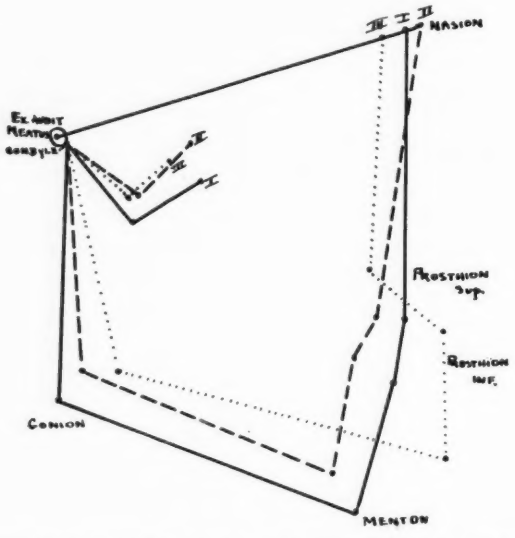


Fig. 6.—Diagrammatic presentation of facial profiles of the white males, showing how Class II, division 1, and Class III cases of malocclusion differ from the normal. *I* (solid line) indicates the normal; *II* (broken line), Class II, division 1; *III* (dotted line), Class III.

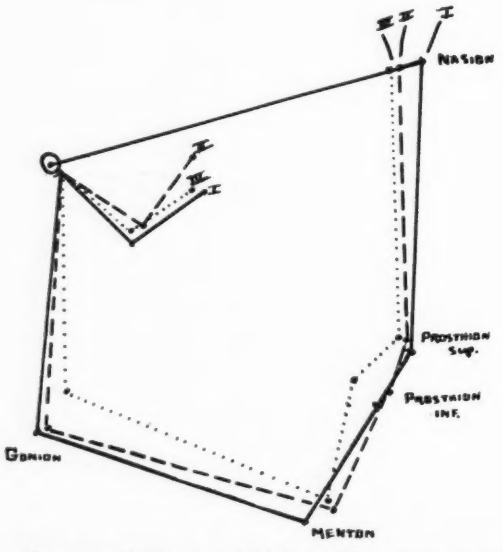


Fig. 7.—Diagrammatic presentation of facial profiles of three Class II, division 1 cases of malocclusion, showing how they differ among themselves. (Am. Mus. specimens 99/7891, 99/7794, 99/7775.)

and posterior portions of the palate and both dental arches. Those below normal are associated with the ramus and body of the mandible. The facial and canine angles (Table XIV) are more obtuse than in the normal, while the upper alveolar, the gonial and mental angles fall within the range of

variability of the normal. In position (Table XV) the Class II, division 1, face approaches the normal in the uppermost (auriculonasion) region, receding backward in the upper auriculoprosthion by about two millimeters, in the lower auriculoprosthion by 8.5 mm., and in the auriculomenton dimension by about 6 mm. The specific features of the face of this Class II, division 1, case, is consequently due to a lack of growth in width, an underdeveloped mandible, more obtuse facial and canine angles, slightly posterior position of the upper alveolar arch, and an excessively posterior position of the lower alveolar arch and body of the mandible.

I should at this time like to call your attention to the fact that not all Class II, division 1, cases present the same specific features. They, too, differ from one another. The manner in which they differ is clearly pointed out in Tables XVI, XVII, XVIII, XIX and XX, showing how the Class II,

TABLE XVI

SHOWING COMPARISONS IN HEIGHT OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (HINDU MALES)

SEX		MALES		99 (7891) CL. II. DIV. 1 ⌣+	99 (7794) CL. II. DIV. 1 ⌣0	99 (7775) CL. II. DIV. 1 ⌣+
Heights	N.	A.	S.D.			
Total	27	111.79	8.58	117	110	107
Upper	28	65.13	5.19	+71	67	66
Lower	28	31.21	3.46	34	32	30
Dental	20	16.50	2.71	15	15	15
Nasal	27	48.89	3.75	51	48	47
Subnasal	28	16.29	3.38	+20	19	19
Palate	28	14.14	2.17	+18	16	13
Post. Nares	28	26.11	2.24	25	26	28
M. Region	28	27.11	2.32	+30	+30	25
Condylar	28	60.89	5.07	64	63	–54
Coronoid	28	63.89	5.12	+72	+75	–58
Sig. Notch	28	13.57	1.67	15	15	12

TABLE XVII

SHOWING COMPARISONS IN WIDTH OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (HINDU MALES)

SEX		MALES		99 (7891) CL. II. DIV. 1 ⌣+	99 (7794) CL. II. DIV. 1 ⌣0	99 (7775) CL. II. DIV. 1 ⌣+
Width	N.	A.	S.D.			
Bizygo.	28	126.29	4.86	129	127	–120
Bimalar	28	95.42	5.28	91	100	100
Bicanine Upper	28	38.46	2.86	–35	40	38
Bicanine Lower	27	32.59	2.42	–29	33	32
Max. Alv. Upper	28	61.82	3.37	62·	61	60
Max. Alv. Lower	28	66.36	3.24	66	65	67
Nasal	28	25.29	2.24	–22	+28	–23
Post. Nares	28	29.71	2.70	28	30	28
Interorb.	28	21.86	2.25	22	21	21
Palate Max.	28	40.04	3.01	39	40	39
Palate Min.	27	25.52	2.23	–20	27	24
Bicondylar	28	113.68	5.05	+120	114	111
Bigonial	28	97.42	6.09	–91	+104	–90

division 1, faces differ from the norm and among themselves in the Hindu males. For a detailed analysis, the reader is referred to those tables. In a general way, it may be stated that in each instance where a Class II, division 1, manifestation is prevalent, it is usually associated with some form of underdevelopment of the mandible. In those cases where the mandible as a whole, or only in part, is not actually smaller, the angle is more acute, permitting the alveolar arch to extend forward insufficiently. The canine angle, more popularly known as the orbital plane, which has been playing such an important part in the diagnosis recently, is always either within the range of normal variability or even more obtuse; i.e., the canine is further back than in the normal. In position the face in Class II, division 1, cases is either receded in the lower alveolar region when the angle is normal, or it is normal in position when the angle is more acute in which case the upper alveolar arch is relatively further forward than is indicated by the average of the normal. Fig. 6 presents a comparison of the diagrammatic profile of the Class II, division 1, case as it differs from the normal in the white males. Fig. 7 presents diagrammatic profiles of three Class II, division 1, cases of the Hindu, showing how they differ among themselves.

COMPARISON OF SKULLS WITH DENTITIONS IN NORMAL OCCLUSION AND CLASS III MALOCCLUSIONS

In Fig. 8, *A* and *B* is shown a skull of a white male (337 W. R. U.) with a Class III case of malocclusion. While it would be a simple matter to diagnose the case as such, it would be difficult to say with any degree of certainty just what particular features have gone wrong to bring about such a deformity. By resorting to Tables XI, XII, XIII, XIV, XV, a more detailed account can be obtained of the real situation in this case. Thus, it will be found that the height of the face is reduced in every particular but three. In the one instance, in the symphyseal regions, the mandible is within the range of variability of the normal, while the dental height and palate height are greater. In width the maximum upper alveolar arch, the nasal aperture, the posterior nares and bigonial are within the range of variability of the normal. The widths of the lower bicanine and maximum lower alveolar arch exceed the normal, and the other features are narrower than the normal. In depth the palate, the upper alveolar arch, the ramus and the condylo-coronoid distance is less than in the normal. The palate process of the palate bone, the alveolo-ramus and the lower alveolar arch are equal to normal in depth, exceeding the normal dimensions only in the preramus region and basal depth of the mandible. These dimensions emphasize the fact that despite the extremely abnormal condition in this case, the mandible exceeds the normal depth only in the portion anterior to the ramus, i.e., in the body and alveolar process. The ramus itself is smaller in every respect. The angle of the face, of the upper alveolar process and of the mandible are within the range of variability of the normal. Those of the chin and canine are more acute. In position the upper face is retreated; the lower alveolar process is within the range of variability while the chin is considerably more forward. This, again, points to the fact that the upper face is underdevel-

oped, the lower alveolar arch is mutilated and the body of the mandible overdeveloped. But in position, only the chin region is more anterior than normal. Fig. 6, presenting the diagrammatic profile of this case, shows how it differs from the normal. Fig. 9 presents diagrammatic profiles of the faces of three white males with dentitions in Class III malocclusion, giving a rough

Fig. 8-*A*. Fig. 8-*B*.

Fig. 8.—Photographs of skull (337 W. R. U.) with dentition in Class III malocclusion. *A*, Right side view showing extreme deformity of this type of malocclusion. *B*, left side view showing a like condition as on the right side.

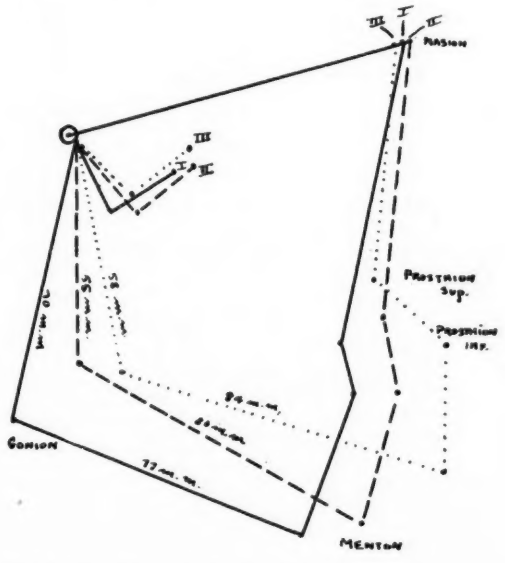


Fig. 9.—Diagrammatic representation of facial profiles of three Class III cases of malocclusion to show how they differ among themselves. (W. R. U. specimens, 654, 1043, 337.)

idea of how those manifestations may differ among themselves. For a more detailed account reference should be made to Tables XI, XII, XIII, XIV and XV. In contrast to this, I shall present the measurements of another Class III case found among an adult group of some ancient American Indians. As shown in Table XXI the features typifying Class III are also found in

TABLE XVIII

SHOWING COMPARISONS IN DEPTH OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (HINDU MALES)

SEX		MALES		99 (7891) CL. II. DIV. 1 ⌣+	99 (7794) CL. II. DIV. 1 ⌣0	99 (7775) CL. II. DIV. 1 ⌣+
Depth	N.	A.	S.D.			
Total Palate	28	47.25	2.69	49	48	47
Ant. Palate	28	36.21	2.98	36	38	–31
Post. Palate	28	11.04	2.92	+14	10	+16
Alv. Ramus	28	79.11	3.93	82	79	77
Pre. Ramus	28	48.32	3.31	47	49	–45
Ramus	25	31.44	1.84	+35	32	33
Basal	28	73.86	4.06	70	74	70
Alv. Arch Upper	28	49.86	2.72	52	50	51
Alv. Arch Lower	28	49.71	4.30	49	50	53
Cond. Cor. Dist.	28	33.54	2.95	35	32	32

TABLE XIX

SHOWING COMPARISONS IN ANGLES OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (HINDU MALES)

SEX		MALES		99 (7891) CL. II. DIV. 1 ⌣+	99 (7794) CL. II. DIV. 1 ⌣0	99 (7775) CL. II. DIV. 1 ⌣+
Angles	N.	A.	S.D.			
Facial	28	84.21	3.18	+ 90	83	82
Alveolar	28	58.00	8.82	65	54	59
Gonial	28	118.83	6.33	–108	–105	115
Mental	27	61.55	7.56	+ 77	+ 76.	63
Canine	28	71.64	4.75	+ 77	73	71

TABLE XX

SHOWING COMPARISONS IN POSITION OF FACE OF SKULLS WITH NORMAL AND ABNORMAL OCCLUSION. (HINDU MALES)

SEX		MALES		99 (7891) CL. II. DIV. 1 ⌣+	99 (7794) CL. II. DIV. 1 ⌣0	99 (7775) CL. II. DIV. 1 ⌣+
Position	N.	A.	S.D.			
Aur. Nas.	28	90.39	3.04	+95	89	–87
Aur. Pros. Sup.	28	96.39	3.79	100	98	96
Aur. Pros. Inf.	27	100.67	4.25	100	102	–92
Aur. Menton	27	111.78	4.86	108	110	107

this case. But there are some instances in which this case differs from the others. These are concerned in a general increase of all dimensions in size and position of the mandible. Whereas, in the other Class III cases the mandible did not exceed the normal in position in the alveolar region, this does. It also exceeds the normal in the upper alveolar height (subnasal) and interorbital width. In this case, the subnormal conditions are limited to palatal maximum width and depth, auriculonasion position and gonial, facial, alveolar and mental angles. This case, therefore, is in contrast with

TABLE XXI

SHOWING PARTICULARS IN WHICH THIS CLASS III CASE OF MALOCCLUSION DIFFERS FROM THE NORM IN THE ADULT GROUP OF ANCIENT AMERICAN INDIANS

			CLASS III	ADULT GROUP MEAN	ADULT GROUP STANDARD DEVIATION
HEIGHT	1.	Subnasal	28	22.00	3.06
	2.	Mandibular at M_1	65	60.41	4.55
	3.	Ramus Height (at Cor. pr.)	70	62.41	5.88
WIDTH	1.	Interorbital	25	21.80	1.86
	2.	Palate (Maximum)	40	42.53	1.98
DEPTH	1.	Palate	6	10.59	3.78
	2.	Alveoloramus	88	82.50	4.35
	3.	Ramus	53	49.42	3.66
	4.	Basal (Mandibular)	88	79.39	5.01
POSITION	1.	Auriculo-Nasion	83	88.55	5.35
	2.	Auriculo-Menton	124	113.85	7.40
	3.	Auriculo-Prosthion inf.	108	100.85	4.50
ANGLE	1.	Gonial (right and left)	$\overline{r112\|119l}$	117.39	5.58
	2.	Facial	80	84.86	2.34
	3.	Alveolar	58	62.20	5.00
	4.	Mental	63	68.65	5.99

TABLE XXII

SHOWING PARTICULARS IN WHICH CLASS II, DIVISION 2, CASE OF MALOCCLUSION DIFFERS FROM THE GROUP NORM IN THE CHILD GROUP OF ANCIENT AMERICAN INDIANS

			CLASS II DIVISION 2	CHILD GROUP MEAN	CHILD GROUP STANDARD DEVIATION
HEIGHT	1.	Total face	105	88.35	6.85
	2.	Upper face	62	53.34	3.51
	3.	Lower face (Symphysial Ht.)	29	24.00	0.93
	4.	Nasal	45	38.01	2.43
	5.	Mandibular	25	19.29	1.75
WIDTH	1.	Bizygomatic	117	104.25	3.03
	2.	Bimalar	92	82.50	4.60
	3.	Nasal	24	21.90	1.14
	4.	Interorbital	25	18.00	1.53
	5.	Palate (Maximum)	38	34.68	2.85
	6.	Bicondylar	105	95.70	6.20
DEPTH	1.	Palate (Posterior portion)	10	8.55	1.23
	2.	Basal Mandibular	69	62.32	3.93
POSITION	1.	Auriculo-Nasion	85	76.63	4.11
	2.	Auriculo Prosthion (Sup.)	82	78.54	3.33

the other Class III cases by having the upper alveolar arch in normal position, while the lower is anterior to it.

COMPARISON OF SKULLS WITH DENTITION IN NORMAL OCCLUSION AND CLASS II, DIVISION 2, MALOCCLUSION

There remains just one more type of occlusion to be discussed at this time. It is known as Class II, division 2. Of all types of occlusion, it seems that this is least understood. In Table XXII, the differences from the normal condition are depicted. If you will recall, the evidence brought to your attention in connection with Class II, division 1, and Class III, the differences of the abnormal were of a twofold character. They were either below or above normal. In Class II, division 2, you will notice that the dimensions of all the features in which it differs are above normal. The total face

height exceeds that of the normal by a very wide margin. This is also true in the upper face height, symphyseal height and mandibular height. The same characteristic differences is also manifest in the various widths. In depth it may be seen that the palate process of the palate bone and the basal depth (length) of the mandible is greater. In position, again, the auriculonasion dimension as well as the auriculoprosthion superior, is greater.

It would, therefore, seem that in this type of occlusion there is really a condition of *over*development both in the upper and in the lower face. But as the position of the face indicates, the upper alveolar arch is placed more forward than the lower. Since the lower alveolar arch is normal and the upper beyond the normal in position, it is apparent that the upper and not the lower alveolar arch is the deviating character.

THE QUESTION OF THE PRESENT BASIS OF CLASSIFICATION

This situation raises the question: Is our present basis of classification dependable? The actual state of affairs gives an entirely different aspect of what really happens. Mesio- and distoclusion are based upon the relative position of the teeth in the two jaws in an anteroposterior direction. But when the occlusal relationship of the teeth is disturbed mesiodistally, what is to indicate whether the upper or the lower dental or alveolar arches are displaced?

In view of the fact that the present method of classifying the different types of malocclusion rests entirely upon the recognition of the occlusal relationship of the teeth; and in view of the fact that the classification based upon the mesiodistal relationship of the teeth alone does not indicate which of the two dental arches are in abnormal position, it must be concluded that the entire question is open to serious objections.

The abnormality in position of the dental arches, as you all know, is based upon the assumption that the upper first molar is "constant in its position" (Angle). The position of the face, as was shown you, is *not* constant. *It varies*, and this variability is in an anteroposterior direction. If the entire face varies it necessarily carries with it both dental arches which are part of it. How, then, is it possible for the first permanent upper molar to remain constant in its position, when the face as a whole moves? It would seem that under the circumstances, such an assumption is erroneous and using this as a basis to classify malocclusion of the teeth is not in keeping with the actually prevailing conditions.

Let us examine this situation more closely. Fig. 4—*A*, *B*, *C*, illustrates an example of interest. This figure shows an asymmetric difference on the two sides (Fig. 4—*A*). When the face is examined with the jaws in apposition (Fig. 4—*B* and *C*) it is found that there is an abnormality in occlusion. But also note that on the side on which the mesiodistal disturbance in the occlusion of the teeth exists (Fig. 4—*B*), the upper teeth and alveolar process are placed more forward than on the side (Fig. 4—*C*) where normal occlusion prevails. Also note in Table XXII that all those features that tend to create the mesiodistal disturbance in occlusion of Class II, division 2, are overde-

veloped. It is, consequently, impossible to avoid the conclusion that in cases as these it would be more proper to consider the upper alveolar arch and even the entire maxilla, displaced anteriorly, while the lower is in normal position. Again, in seven Class II, division 1, cases, four had both dental arches in normal anteroposterior position, one had both in posterior position and in two, the upper alveolar arch was in normal position while the lower was in posterior position. This would indicate that although the teeth alone are displaced in a relative anteroposterior direction, the alveolar arches and the jaw bones are both in normal position or posterior to normal; or the upper may be in normal position while the lower posterior to it, in which case only, our present basis of classifying Class II, division 1, is justified. In the case of Class II, division 1, where both alveolar arches are posterior in position, the lower is further back than the upper, showing that as development was checked in both alveolar arches, the lower was more affected than the upper. In the case where both alveolar arches are within the normal range of variability, the upper is more anterior than the *average* of the normal, showing a slight degree of *relative* forward displacement of the upper.

In Class III both alveolar arches may be either in a posterior position or in normal position, the teeth alone showing the malocclusion. Most of the cases show the upper alveolar arch in posterior position and the lower in normal position. In seven cases of this type, one had both alveolar arches in posterior position, one in normal position, the upper being relatively further back, and in five the upper was posterior to normal and the lower normal. In the case of the ancient American Indian, the upper alveolar arch was in normal position and the lower anterior to it.

In view of the evidence herewith examined, it would be safe to say, that, the deviations from the normal in occlusion of the teeth known as Class II division 1, Class II division 2, and Class III, are inadequately defined. For a better understanding of the nature of these occlusal disturbances, the statements should be in conformity with the actual conditions. Distal occlusion or mesial occlusion does not suffice to convey a correct idea of what is wrong. I am at this moment tempted to submit some definitions, for your consideration, which would state more clearly what is meant by such symbols as Class II or Class III.

DEFINITIONS

Class II is that form of malocclusion in which the normal relationship of the teeth in the two dental arches is disturbed mesiodistally, the upper alveolar arch being in front of the lower.

Class II, division 1, is that form of malocclusion in which the relationship of the factors of occlusion of a dentition is such as to bring the lower into a *relative* distal position to the upper or the upper into a *relative* mesial position to the lower when the teeth of the two dental arches are in juxtaposition, neither of the alveolar arches exceeding the range of variability of the normal in position.

Class II, division 2, is that form of malocclusion in which the relationship of the factors of occlusion of a dentition is such as to bring the upper

into mesial position to the lower, when the teeth of the two dental arches are in juxtaposition. The lower alveolar arch being in normal anteroposterior position.

Class III is that form of malocclusion in which the normal relationship of the teeth in the two dental arches are disturbed mesiodistally in a reverse direction from Class II.

Class III, division 1, is that form of malocclusion in which the relationship of the factors of occlusion of a dentition is such as to bring the upper into distal position to the lower, when the teeth of the two dental arches are in juxtaposition, the lower alveolar arch not exceeding the range of variability of the normal position.

Class III, division 2, is that form of malocclusion in which the relationship of the factors of occlusion of a dentition is such as to bring the lower into mesial position to the upper, when the teeth of the two dental arches are in juxtaposition, the upper dental arch not exceeding the range of variability of the normal in position.

Of course, I am quite reconciled to the fact that there is not a ghost of a chance of these definitions now meeting with a favorable reception. It really matters little whether they do or not. I am not so much interested in that part of the question. My main interest is to make certain that I have not failed in the attempt of presenting to you certain facts which in my estimation have a direct bearing on the progress of orthodontia.

In order not to be misunderstood, I shall reiterate some points which may help to emphasize the facts observed.

1. The face in its transition from infancy to senility, goes through several stages of development which once attained become characteristic for certain periods of life.

2. Developmental stages of the face are brought about by increase in size, change in proportion, modification in form, and variation in position.

3. Different parts of the same face grow at different rates of speed at a given period of time. The same part grows at different rates of speed at different periods of time. This gives rise to variability in structure.

4. Variability in structure gives rise to variability in parts composed of such structures.

5. The face, consequently, varies in the same individual at different periods of life. It varies in different individuals at the same period of life, i.e., at the same age. It varies in different racial groups.

6. Similarly the face varies in occlusal types. There is considerable variability in types of faces though belonging to the same race and possessing dentitions in normal occlusion.

7. Faces deviate in many specific characters, from the range of variability in the normal, when the dentitions are in such malocclusions as are designated by Class II division 1, Class II division 2, and Class III.

8. By the method of study employed, it was possible to point out the manner in which these deviations occur and the specific characteristics involved.

9. The definitions proposed are only tentative and subject to change if further investigation should warrant it.

Finally, whether the definitions are acceptable or not, the fact remains that the concept of those malocclusal conditions known as Class II and Class III, must be revised to be in accord with the evidence so far produced by actual investigation.

ACKNOWLEDGMENT

In conclusion, I desire to express my indebtedness and gratitude to the Western Reserve University Medical School, for the privilege extended me to examine some of the skeletal material. I am also indebted to the American Museum of Natural History, for the unusual freedom of access to one of the greatest skull collections in the world. I also wish to acknowledge with many thanks, the help received from my associate Dr. Benjamin Lancet, who was kind enough to do all the calculations entailed in this study; a tremendous task requiring a great deal of energy. To my daughter, Edith, for her help in making the diagrams, I wish to express my sincere thanks.

REFERENCES

Angle, Edward H.: Malocclusion of the Teeth, ed. 7, 1907.

Hellman, Milo: A Preliminary Study in Development as it Affects the Human Face, Dental Cosmos, March, 1927.

Variation in Occlusion, read at the meeting of the Eastern Association of Graduates of the Angle School, February 1, 1921, Dental Cosmos, June, 1921.

Changes in the Human Face Brought about by Development; read before the First International Orthodontic Congress, New York City, August 16-20, 1926, Internat. Jour. Ortho., June, 1927.

DISCUSSION

Dr. George W. Grieve.—Of all the wonderful papers which Dr. Hellman has presented, I believe this one is the most definitely applicable to our problem of diagnosis and treatment. We have had great difficulty in some cases to distinguish, particularly in those of Class II, as to which dental arch is at fault. Dr. Hellman's paper today has laid that before us very clearly, and it is very remarkable how he has presented some of the facts.

For instance, he says that in examination of some of those skulls, with normal occlusal relations of the teeth, if the latter were not present you might place some of the skulls in Class II and some in Class III, notwithstanding the fact that the teeth were in their normal relations, which goes to show that it is not only the position of the teeth in the maxilla or mandible which we must consider, but the relation of these bones to the cranium.

Dr. Hellman said that if the face varies it takes the dental arches with it. In many cases of malocclusion I feel convinced that the dental arches are out of harmony in their relation to the cranium. For instance in the Class III case it is a lack of forward growth of the maxilla. It is not that the teeth occupy an abnormal position in the bone itself, but that the whole maxilla is distal in its relation to the cranium. Of course, in some of those cases, as he showed, you may have an overdevelopment, or excessive growth, of the mandible, or there may be a normal mandible.

The essayist made a very distinct differentiation between the cases which we have been in the habit of placing in Class II, as between Division 1 and Division 2. If I may be pardoned for digressing a little from the paper, I would like to make some application of the

points brought out by Dr. Hellman to the treatment of cases of this type. We all know that in Class II, division 2, cases, and also in some which we have believed to be Class I cases, which, by the way, may not be Class I at all, where the maxillary incisors stand very straight, there is a very distinct excessive overbite. It has been very difficult in this type of case to maintain a normal overbite after correction. The reason for this has been that our technic was wrong. We have felt that the fault was mainly in the mandible when it was an overdevelopment of the maxilla.

I call to mind a case of this type treated in our office by my associate, Dr. Fisk, which was placed, I think, in Class I. The apical ends of the maxillary incisors were too far forward. Dr. Fisk got a beautiful result up to the time of retention. The boy went to Boston to school, and we recommended him to Dr. A. LeRoy Johnson for inspection while there. Dr. Johnson commended Dr. Fisk on his very beautiful work. He also said that, in his experience, in that type of case, he had never been able to maintain a normal overbite. In his letter he said: "I would greatly appreciate it if you will keep track of this case, in order to ascertain whether the normal overbite can be maintained or not."

That letter from Dr. Johnson started me thinking of my cases of this type and after considerable investigation I became convinced that Dr. Johnson was right. I feel that it is the concensus of opinion of all of you that you have had your difficulties in these cases.

What Dr. Hellman has brought out is that the cases in the second division of Class II differ very distinctly from those of the first Division in that in the former the whole maxilla is mesial to normal in its relation to the cranium, or, as I would understand, the roots of the maxillary incisors are more forward than you will find in the cases of the first division. In the first division cases the apical ends of the roots may often be in their normal position, while the crowns are tipped forward, what Simon would call "a dental protraction."

Just a word as to the treatment of that type of case where the maxillary incisor roots are too far forward. For the last couple of years I have been carrying the apical ends of these maxillary incisor roots lingually. If you tip the crowns of the maxillary incisors labially and attempt to carry forward the mandibular teeth in these cases, you will fail, but if you carry the apical ends of the roots lingually so as to place them in their normal relation to the cranium and establish the normal angle of inclination, you will be able, I think, to maintain a normal overbite.

Dr. Hellman.—I wish to thank the discussors for their very kind remarks, and I wish to tell you that this is not the end of my investigation, it is only a stage in the course of this procedure. It had to be interrupted so that I could bring for your consideration what I have at present.

Class I has not been considered at all. In my estimation Class I has great possibilities, and will explain a great deal as a contributing factor between the normal and Class II and III. At present I have not any evidence to offer you.

Dr. Johnson made some remarks with reference to the modern material. The material used for this main or chief problem was material of very recently dead people. All the material at the Western Reserve University is obtained from individuals that die as they go along, (laughter) so this is quite recent and modern.

In spite of this fact I wish to assure you that my investigation is not limited to dead material alone. I am conducting a study of the living too. But in my earnest effort to eliminate errors and bring as much reliable proof as I can, I find it necessary to limit myself first to skull material. Even in skull material you must know there is a great deal of error possible with measurements, but if we are honest and go over measurements, we can find the source of error. I think it is erroneous for anyone to start an anthropometric investigation on the living, without having a well developed technic, for even skull material is replete with error. Unless you have that, the living data you obtain isn't worth anything. Therefore, by preceding my feature studies with a thorough understanding of skeletal material I shall be better equipped to handle the problem as it presents itself in our offices. Thank you very much for your kind attention. (Applause.)

Dr. Grieve.—We owe Dr. Hellman an immense vote of gratitude for this wonderful paper. (Applause.)

Might I ask Dr. Hellman if he believes the buccal teeth, or the apical ends of the roots of the buccal teeth, are ever too far distal in relation to the bone itself, either in maxillae or mandible?

Dr. Hellman, New York City.—I couldn't answer that question, Dr. Grieve. Belief doesn't count in scientific work. (Laughter.)

Dr. Grieve.—From observation, and a careful study of diagnosis and treatment over a very long period, I am now convinced that the apical ends of the roots of buccal teeth are rarely, if ever, too far distal in the bones in which they rest, and certainly not in the mandible in distoclusion cases.

THE POSSIBILITIES OF GNATHOSTATICS IN DIFFERENTIAL DIAGNOSIS*

By A. C. Rohde, D.D.S., Milwaukee, Wis.

THERE have been many attempts to establish a classification of dental anomalies which would facilitate diagnosis. None of these gave any intimation as to the deviation found, its degree, or the part of the organ involved, much less dentofacial relations.

Some of these classifications were made either from the standpoint of anatomy or etiology, or from a combination of the two. Schroeder even evolved a classification of normal dentures according to function. Angle's classification was based on the intraoral method and the constancy of the first molars. Lischer's is similar to Angle's except that he designated Class I, II, III, by neutroclusion, distoclusion, and mesioclusion. In justice to him, however, it must be said that he included deformities of the jaws for which he suggested the terms micro-, and macrognathia. Case made an attempt at dentofacial relations, but his conclusions were merely subjective.

That we were in need of a more comprehensive classification, one that considered the teeth and jaws in relation to the head, was recognized years ago by such men as Kingsley, Farrar, Carabelli, Goddard, Van Loon and others.

Orthodontics has made great strides in mechanics, but diagnosis has not kept pace with this progress. While Angle's classification dominated orthodontic thought possibly longer than that of any one man, and while I may be premature in my prediction, I believe that it must eventually join that innumerable caravan of discards which have served us, but have been found wanting. In gnathostatic diagnosis I believe that we have found something more useful. The pioneers who worked along these lines for years, if living today, could appreciate the old axiom, "All things come to those who wait." My only regret is that our beloved Dr. Case could not live to see the fulfillment of his dreams.

In a differential diagnosis according to the Simon method, we no longer deal with the denture as an isolated body but as an anatomic and physiologic

*Read before the Twenty-sixth Annual Meeting of the American Society of Orthodontists, Chicago, May 2-5, 1927.

part of the head. This is accompanied by measurements of the denture in its relation to the three planes of the head, which are established by using gnathostatic models and photostatic photos. The technic for marking these planes is familiar to all of you. With the gnathostatic models and the photostatic photos at hand, we shall proceed to record the data on the graph chart and then to establish the diagnosis.

The first measurements are made from the median plane. To begin, measure the widths of the upper incisors, preferably in the mouth. The sum total of these widths is taken and a reference made to Pont's chart which gives the corresponding distance between the distal pits of the first premolars and the central fossae of the first molars. These are measured off on graph paper on their respective lines with the point to the right marked P. (Pont.)

Now measure these widths, either in the mouth or on the models, on the latter with the symmetrograph if we wish to ascertain symmetry or asym-

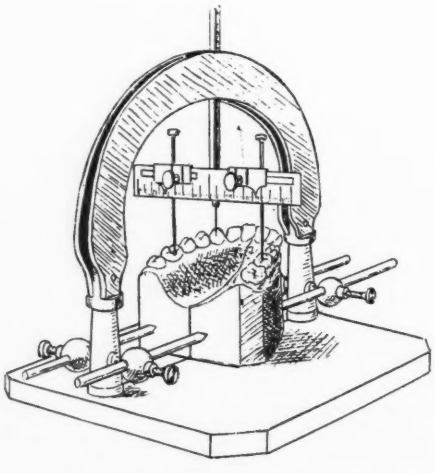


Fig. 1.

metry (Fig. 1). The width of each is then transferred to the graph paper on its respective line and the point marked *B* (Fig. 2). The difference between the two points, if any, is the distance we wish to establish.

The palatal curve is measured on a line parallel to the orbital plane and 2 cm. posterior to it (Fig. 3).

Measurements are taken every 5 cm. to either side of the median plane from the ear eye plane and extending to the gingival margin. These are measured on the diameter with a compass by measuring the groove on the perpendicular rod. The ordinates are drawn to the points of measurements and the secants are drawn through the points laid off thereby, thus projecting the curve of the palate and the distance from the ear eye plane (Fig. 4).

The saggital curve of the palate is measured in the median plane every 10 mm. posterior to the orbital plane and 5 mm. anterior to it, to a point called the prosthion. The same instrument is used as for the palatal curve. The ordinates are drawn as above and the secants represent the projected

sagittal curve of the palate in the median plane and the distance from the ear eye plane. Thus we see that physiologic growth and pathologic malformations can be determined.

The occlusal curve is made by marking the occlusal points with a sharp pencil and then projecting the distance between these and the ear eye plane.

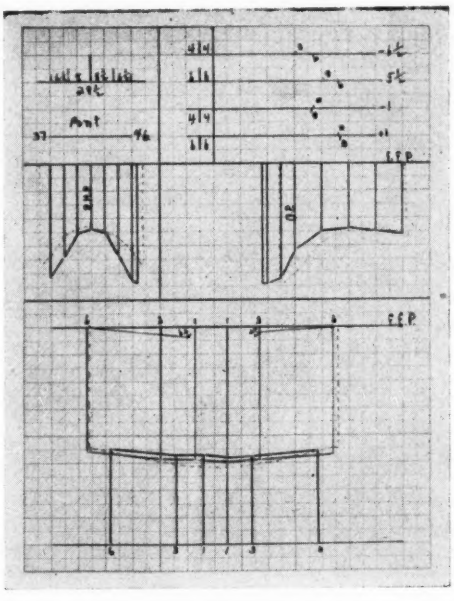


Fig. 2.

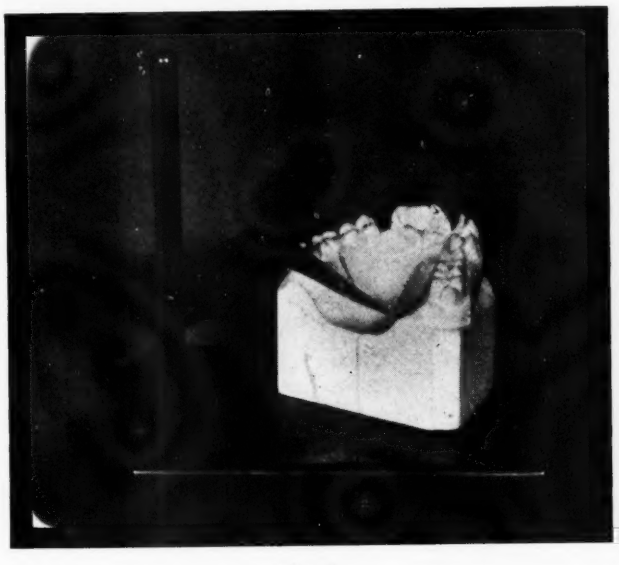


Fig. 3.

In general routine we select the occlusal points of the centrals, cuspid, and the distobuccal cusp of the upper first molar, but if a very accurate curve is desired, each cusp can be measured. After the points are marked, the cast is placed in the diameter and the slide compass is adjusted (Fig. 5).

The two needles are then adjusted to touch two of the points, beginning

with the distobuccal cusp of the upper molar. Move the needle from measure point to measure point until the molar on the opposite side is reached. The projected distance between every two points is measured with a compass from the two countersunk depressions of the sledges and then transferred to a straight line on the graph sheet (Fig. 6).

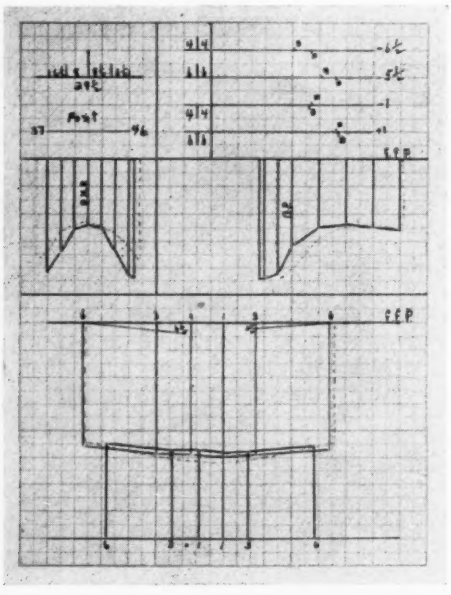


Fig. 4.

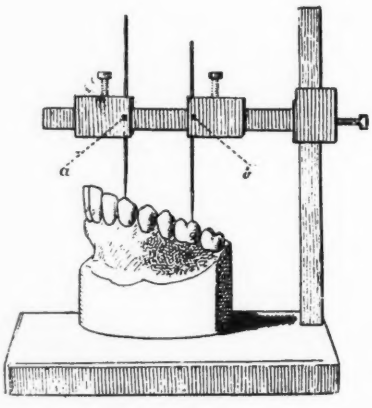


Fig. 5.

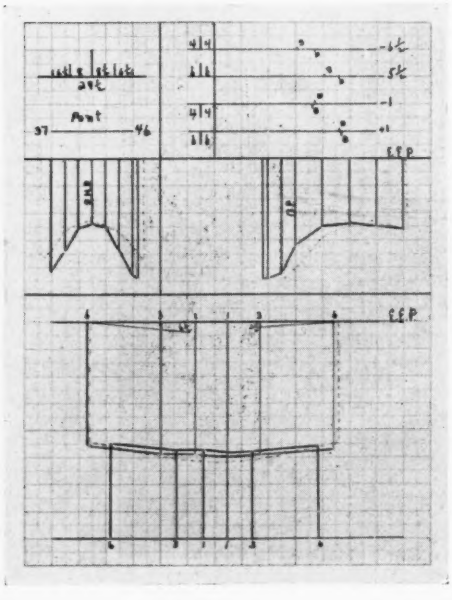


Fig. 6.

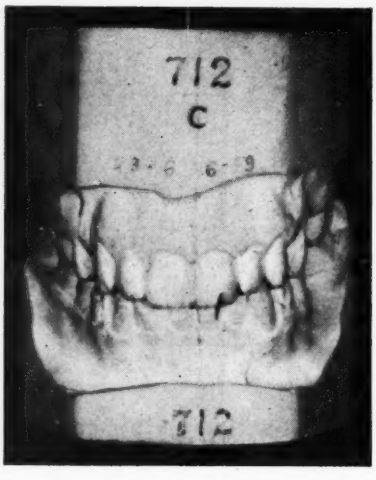


Fig. 7.

Parallel to the base line and 8 cm. from it, draw another line on which we locate the distances between the corresponding points on the lower model. On the lower incisors take a point on a line drawn from one of the upper incisor points, with the models in occlusion (Fig. 7). The remaining lower

points are then marked and the measurements transferred to the lower line on the graph, starting at the center and working to either side.

To determine the vertical distance between measure points, the adjustable arm with the sharp point is placed on the diameter (Fig. 8). The

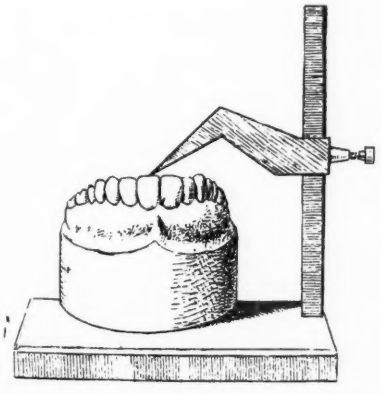


Fig. 8.

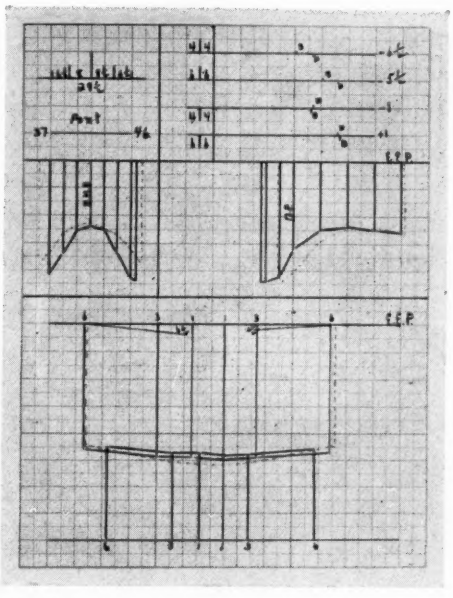


Fig. 9.

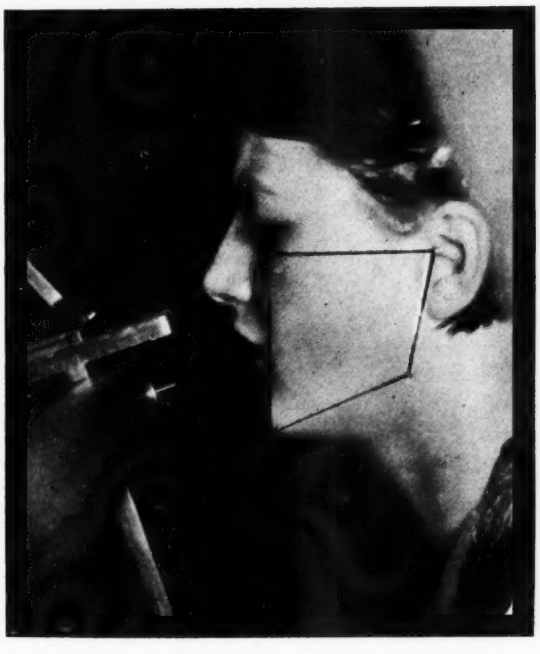


Fig. 10.

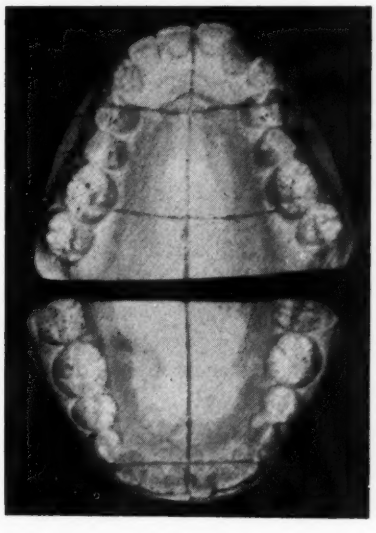


Fig. 11.

upper and lower casts are then ready for measuring the vertical distances between the occlusal points and the bases. Each point of measurement is brought in contact with the sharp point of the movable arm. The perpendicular rod contains a measuring groove in which the points of the

compass are inserted. This gives us the distance from the base end of the groove to the collar end. The measurement is taken and transferred to its proper ordinate. The various points on the ordinates are then connected, giving us the projection of an occlusal curve (Fig. 9).

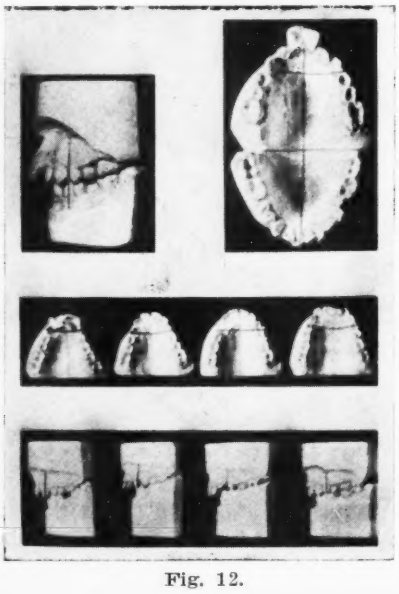


Fig. 12.

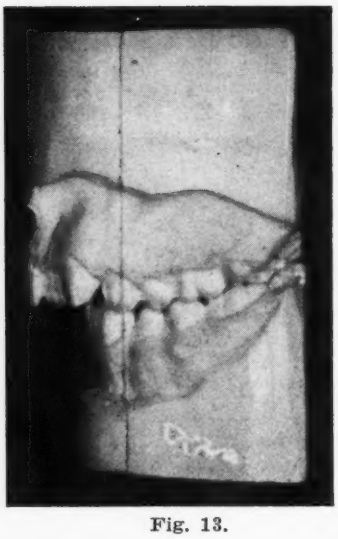


Fig. 13.

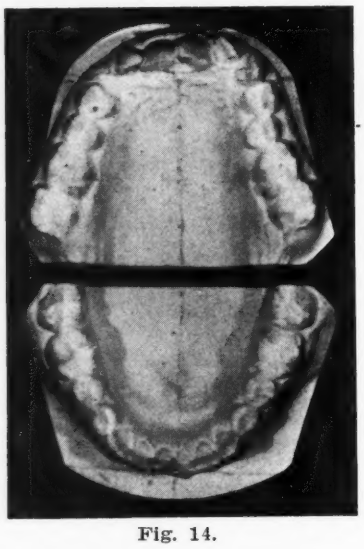


Fig. 14.

A large number of curve graphs are essential to procure the typical "normal" curve. By measuring the length of the ordinate of $\frac{6}{|}$ and placing it on the ordinate of $\frac{3}{|}$, and marking the point, a line can be drawn to the point where the ordinate of $\frac{6}{|}$ meets the ear eye plane.

The angle formed between this line and the ear eye plane can be measured with a protractor, thus giving us the angle between the occlusal plane and the ear eye plane.

In addition to the gnathostatic models we have the photostatic photo to supplement our diagnosis. The negative is placed on an illuminated field, film side up. A line is drawn through the points of the left tragion and the orbital point. This line will correspond to the Frankfort horizontal plane. A perpendicular is then drawn to this plane at the orbital point and the gnathion is marked at the lowest and most anterior point of the chin (Fig. 10). A line is ruled from gnathion to gonion and gonion to tragion.

With these recorded measurements we proceed to make the diagnosis on a separate sheet of paper which is part of the patient's history chart. The capital letter *A* designates the measurement from the median plane.

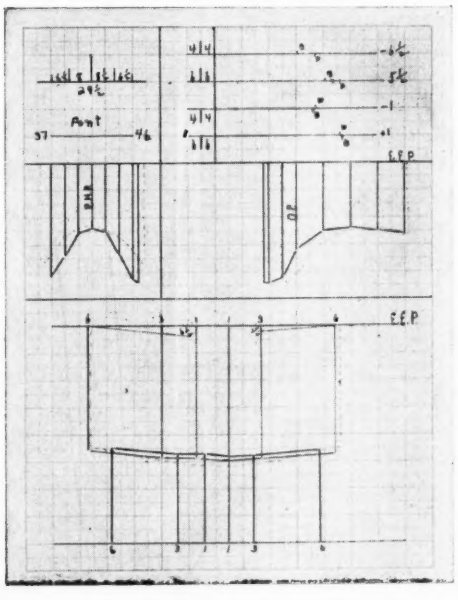


Fig. 15.

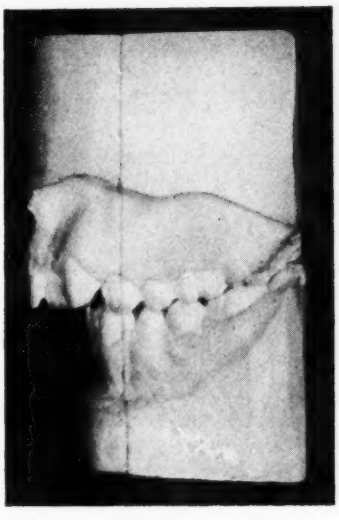


Fig. 16.

From the above measurements, if an anomaly exist, which we will assume to be a contraction, we must determine whether it is a dental, alveolar or a maxillary contraction of the upper jaw and also the lower jaw. This is recorded under the heading *A*. If the crowns of the teeth are inclined toward the median plane, the term dental contraction is applied, and an alveolar contraction designates a condition where the teeth are perpendicular to the plane (Fig. 11). A maxillary contraction is difficult to determine in the living subject and is not so important as the other two.

The discrimination between dental and alveolar contraction in the lower jaw is similar to the upper. The above is also applicable to deviations of distraction.

Under the heading *B*, measurements are made from the orbital plane and the terms protraction and retraction are used. Under each must be determined whether the case is one of dental, alveolar, or maxillary pro-

or retraction, and in the lower, mandibular pro- or retraction. Here we observe the position of the teeth in relation to the orbital plane (Fig. 12). In dental protraction the teeth are not parallel to the orbital plane but are tipped anteriorly. If the sagittal deviation of all the crowns is evident, we have a total dental protraction.

In an alveolar protraction two forms are differentiated. First, alveolar protraction plus anterior dental protraction and second, alveolar protraction plus anterior dental retraction. In the first form the orbital plane is usually posterior, although it may pass directly through the cuspids, especially in cases with medium or extreme contraction (Fig. 13).

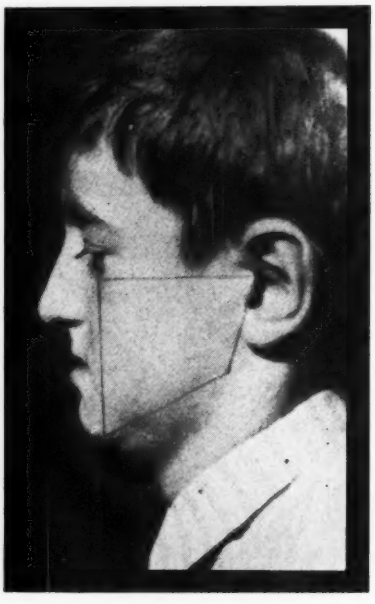


Fig. 17.

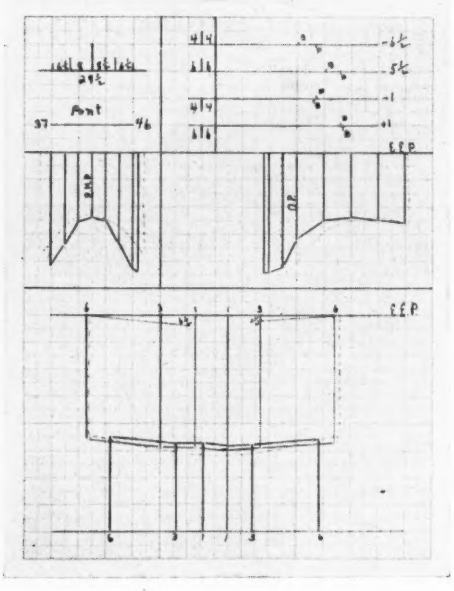


Fig. 18.

In the second form the orbital plane may pass through the cuspid and through the retruding crowns of the anterior teeth, the roots of which are malposed labially (Fig. 14).

On the graph will be recorded, in millimeters, the exact distance of the prosthion from the orbital plane (Fig. 15). In a pure alveolar protraction, the incisors would be parallel to the orbital plane.

As in maxillary contraction, a maxillary protraction cannot be clearly demonstrated in the living. We may surmise that a maxillary protraction exists with the presence of the following signs: the teeth in an upright position, the dental arches approximately of normal width and form, and the anterior position of the alveolar process presenting a flattened appearance, not bulging labially. The orbital plane bisects the denture posterior to the canines. The subnasion in the photostatic photo lies too far forward and the upper lip is unduly prominent.

Dental and alveolar protractions of the lower jaw are recognized by the same standards except that normally, of course, the orbital plane passes

through the distal angle of the distal inclined plane of the lower canines (Fig. 16). A mandibular protraction is much easier to diagnose than is a maxillary protraction. The anterior position of the gnathion in the photo is a cardinal system (Fig. 17).

The various forms of retraction, namely, dental, alveolar and mandibular, must be classified in the same manner.

A consideration of the mesiodistal relation of the arches is a valuable adjunct in diagnosing anomalies under the heading *B*. If a cusp deviation exists, presupposing the presence of all teeth, then a protraction or retraction exists. In establishing the degree of deviation, it is best expressed in terms of the width of the premolar. Under this group *B* it should be mentioned that in cases of forced bite, in both mandibular pro- and retraction, measurements may show an abnormal relationship when in fact no deformity exists. For instance, in linguoversion of the upper incisors, the mandible will move forward the width of the incisors labiolingually, in order to allow the posterior teeth to come into apposition. On the photo, the gnathion would occupy an anterior position as in the case of a protraction.

In group C, deviations are measured from the ear eye plane. The clinical symptoms are, of course, the deep and open bite. Measurements from the ear eye plane are taken from the incisal edges of the centrals, the tip of the canine and the distal cusp of the molar (Fig. 18). These are then joined by lines which give the occlusal curve for that case. A pattern of celluloid of a normal or average curve is then placed over the graph and its outline marked with dotted lines. In this way the deviation is determined. For this average curve we need a greater number of cases and I would recommend that the above be used tentatively, until such data are available.

In summarizing, we must conclude that measurements from the three planes give us the following:

1. The median plane.
   a. Symmetry or asymmetry.
   b. Contraction or distraction and their degree.
   c. Inclination of the tooth axis.

2. The orbital plane.
   a. Sagittal symmetry.
   b. Pro- or retraction and the degree.
   c. Inclination of the tooth axis.

3. The ear eye plane.
   a. The distance between the ear eye plane and the occlusal plane.
   b. The angle between the ear eye plane and the occlusal plane.
   c. Inclination of the tooth axis.
   d. Form of the occlusal plane.

4. The photostatic photo.
   a. Position of the gnathion.
   b. Position of the cheilion in relation to the orbital plane.
   c. Relation of the line from subnasion to labial tubercle to orbital plane.
   d. Linear measurements of the ascending and horizontal ramus.
   e. Angle of the gnathion.
   f. Comparative study of facial lines and growth.

The following cases will, no doubt, further clarify gnathostatic diagnosis and will demonstrate its practical application.

CASE 1.—Figs 19 and 20.

Description of the diagnosis.

Combined width of $\frac{21|12}{|}$ — 29.5 mm.

Width of $\frac{4|4}{|}$ — 30.5 mm. $\frac{4|}{|}$ — 15.5 mm. $\frac{|4}{|}$ — 15 mm.

Width of $\frac{6|6}{|}$ — 40.5 mm. $\frac{6|}{|}$ — 20 mm. $\frac{|6}{|}$ — 20.5 mm.

Width of $\frac{|}{4|4}$ — 36 mm. $\frac{|}{4|}$ — 18 mm. $\frac{|}{|4}$ — 18 mm.

Width of $\frac{|}{6|6}$ — 47 mm. $\frac{|}{6|}$ — 23 mm. $\frac{|}{|6}$ — 24 mm.

According to Pont.

$\frac{4|4}{|}$ — 37 mm.

$\frac{6|6}{|}$ — 46 mm.

The difference amounts to 6.5 mm. in the premolar region and 5.5 mm. in the molar region. This is called a medium contraction because it is more than 5 mm., and the contraction is quite symmetrical (Fig. 21). Further, this is an alveolar contraction because the premolars and molars are parallel to the median plane. The lower jaw is quite symmetrical.

We find that the orbital plane passes through the tips of the cusps of the first premolars in the maxilla.

The prosthion is 12 mm. anterior to the orbital plane.

In the lower the orbital plane passes through the distal inclined planes of the canines.

The profile shows that the cheilion touches the orbital plane (Fig. 22).

The oral fissure slopes upward from the orbital plane.

The gnathion lies slightly to posterior.

The line from the subnasion to the labial tubercle is short and concave.

The mentolabial sulcus is very shallow.

The gonion angle is 126°. The tragion angle is 83°.

The linear measurements are:

Tragion—gonion	16 mm.
Gonion—gnathion	18 mm.
Tragion—orbitale	21 mm.
Orbitale—gnathion	22 mm.

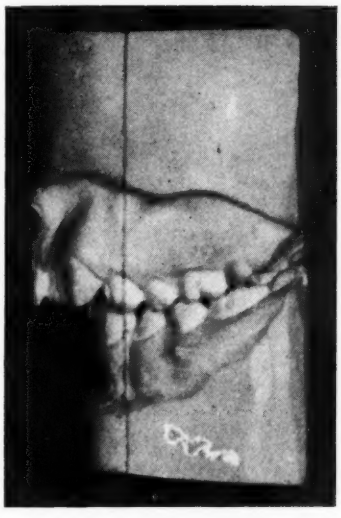


Fig. 19.

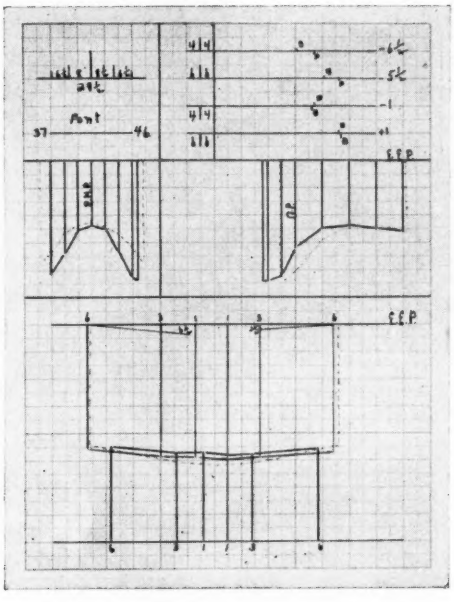


Fig. 20.

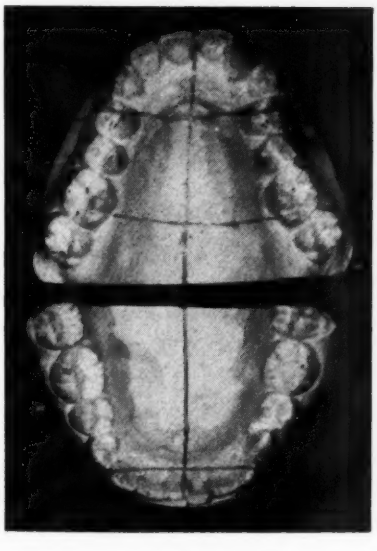


Fig. 21.

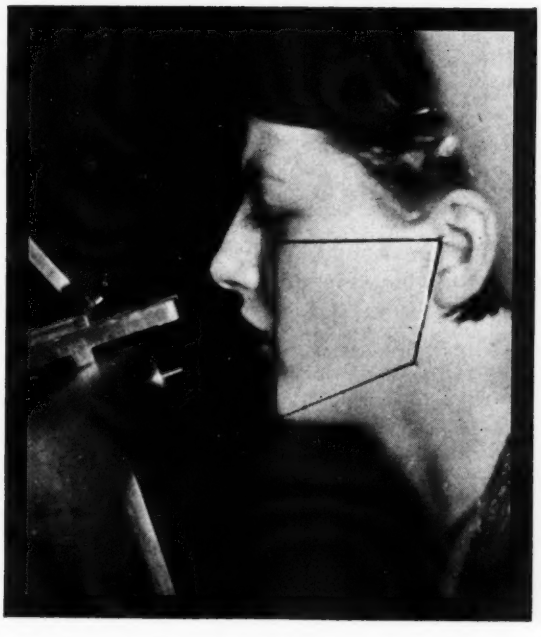


Fig. 22.

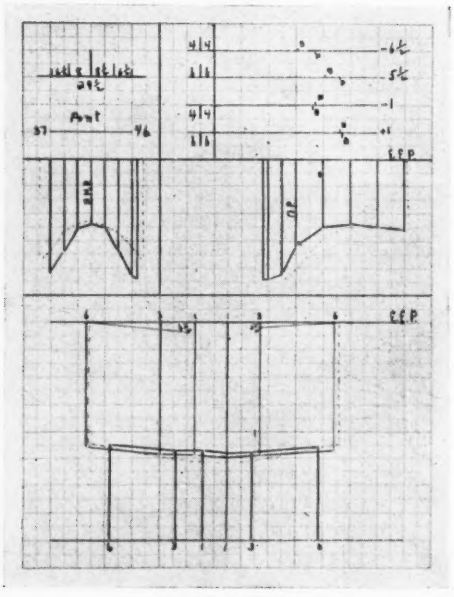


Fig. 23.

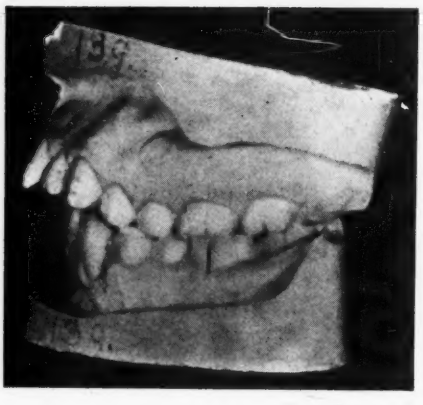


Fig. 24.

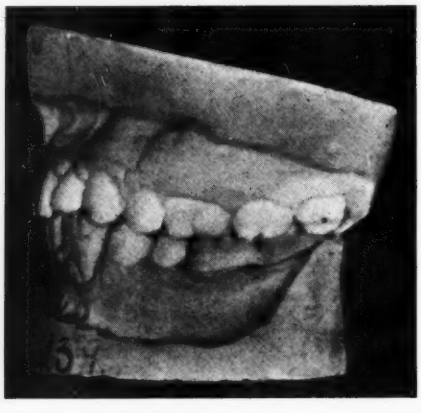


Fig. 25.

By superimposing the celluloid occlusal curve graph, it is found to correspond approximately to the normal curve (Fig. 23).

In summary, the diagnosis is as follows:

A { Upper—medium, symmetrical, lateral, alveolar *Contraction.*
  { Lower—very mild, symmetrical, lateral, dental *Contraction* in $\frac{-|-}{4|4}$

B { Upper—(1/1) symmetrical, total, alveolar, *Protraction.*
  { Lower—(1/4) symmetrical, dental, plus alveolar incisal, *Retraction.*

C { Upper—
  { Lower—

Case 2.—This case was treated by Dr. M. N. Federspiel in 1914. At that time he considered it a neutrocclusion with mesioversion of all the upper anterior teeth (Figs. 24 and 25).

He extracted the two upper first premolars and retracted the upper six anterior teeth. His reasons, however, were based only on subjective observations. Fig. 26 shows the gnathostatic models fourteen years after treatment.

Fig. 26.

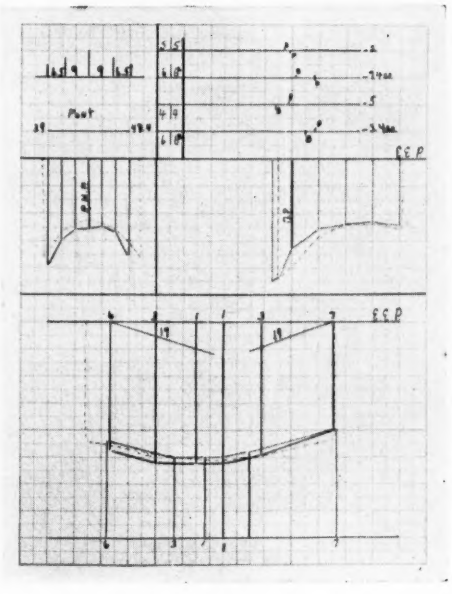


Fig. 27.

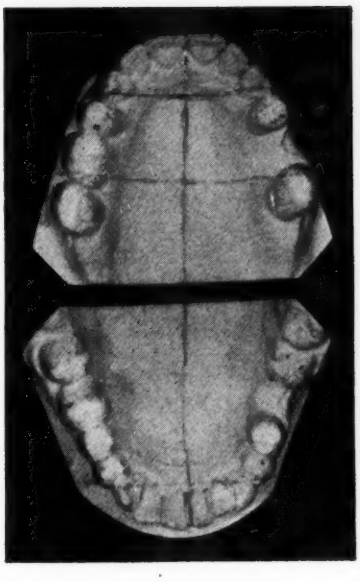


Fig. 28.

Description of the diagnosis (Fig. 27):

Combined width of $\frac{21|12}{|}$ — 31 mm.

Width of $\frac{4|4}{|}$ — 37 mm. $\frac{4|}{|}$ — 19 mm. $\frac{4|}{|}$ — 18 mm.

Width of $\frac{|}{4|4}$ — 34 mm. $\frac{|}{4|}$ — 16 mm. $\frac{|}{|4}$ — 18 mm.

Width of $\frac{6|6}{|}$ — 41 m. $\frac{6|}{|}$ — 21 mm. (assumed) $\frac{|6}{|}$ — 20 mm.

Width of $\frac{|}{6|6}$ — 45 m. $\frac{|}{6|}$ — 23 mm. (assumed) $\frac{|}{6|}$ — 22 mm.

According to Pont.

$$\frac{4}{-}\Big|\frac{4}{-} \quad 39 \text{ mm.}$$

$$\frac{6}{-}\Big|\frac{6}{-} \quad 48.4 \text{ mm.}$$

The difference, therefore, is 2 mm. in the premolar region. This would indicate that the upper jaw was quite normal in width. The upper left first molar had been extracted so measurements taken in that region are assumed.

In the lower there is a difference of 5 mm. in the bicuspid region. The left first molar had been lost, so measurements taken in that region are assumed. This would be considered a mild, anterior, alveolar contraction because the premolars and molars are parallel to the median plane (Fig. 28).

Fig. 29.

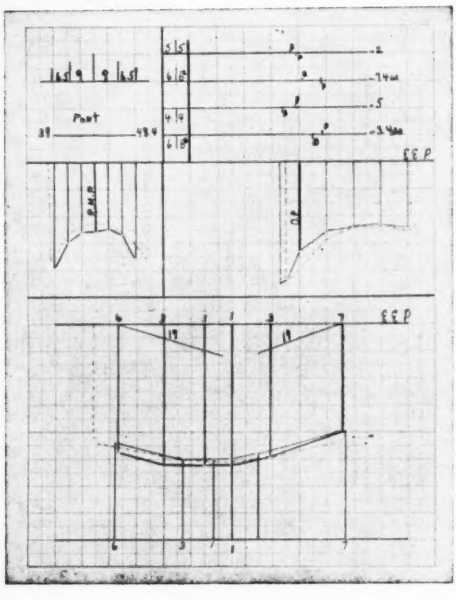


Fig. 30.

The orbital plane passes through the distal inclined planes of the upper canines and through the mesial inclined plane of the lower premolars.

The prosthion is 7 mm. anterior to the orbital plane.

The profile shows that the cheilion touches the orbital plane. Figure 29.

The oral fissure is perpendicular to the orbital plane.

The gnathion lies slightly posterior to the orbital plane.

The line from the subnasion to the labial tubercle is slightly concave and parallel to the orbital plane.

The mentolabial sulcus is anterior to the orbital plane, sloping upward and anteriorly to the prominent lower lip.

The gonion angle is 138°. The tragion angle is 81°.

The linear measurements are:

Tragion—gonion	14 mm.
Gonion—gnathion	18 mm.
Tragion—orbitale	21 mm.
Orbitale—gnathion	23 mm.

By superimposing the celluloid occlusal graph curve, we are able to compare the two and find that they nearly approximate (Fig. 30).

In summary, the diagnosis is as follows:

A { Upper—mild anterior, medium posterior, symmetrical, lateral, alveolar, *Contraction.*
Lower—mild, symmetrical, lateral, alveolar, *Contraction.*

B { Upper—(1/1) symmetrical, lateral, dental, *Protraction.*
Lower—(1/4) symmetrical, mild, total, dental, *Protraction,* plus vertical, mandibular, *Retraction.*

C { Upper—
Lower—

In closing I wish to acknowledge my indebtedness to Dr. Paul W. Simon for his book entitled, "Fundamental Principles of a Systematic Diagnosis of Dental Anomalies," and to Dr. B. E. Lischer who made possible its translation.

DISCUSSION

Dr. Allen Holman Suggett.—Dr. Rohde has presented this subject in a very clear manner and with his slides has given you a very graphic picture of the way to make a differential diagnosis.

He has made each step so clear that any one who is interested should have no trouble making the impressions, models, and graphs, and from these to proceed to the making of a differential diagnosis.

The first thing that occurred to me on looking at the title of his paper was that perhaps in a few years we will discard this whole system for something better. It is hardly possible that we have reached finality on anything in orthodontics yet, for we are as a profession only about twenty-five years old so we have gone only a very short way on the long journey toward perfection. But this method of making a diagnosis by the help of gnathostatics is surely a long step forward and we should make use of it until something better is discovered to take its place.

It is the first step that has been taken to show the relation of the teeth to the head. For years we have been discussing pro and con about teeth being forward and back, etc., and at the same time we have never had in mind any conception of a point, line or plane from which to really measure and therefore decide in what relation the teeth were to the head. Is that scientific?

So here is a simple method, founded on cephalometric methods, using three planes, two of which have been used by anthropologists for many years, by which the teeth can be located from three dimensions.

The gnathostatic models show you all the points that the old models did and in addition they show all those important things that Dr. Rohde has pointed out to you.

The gnathostatic models taken before and after will show you absolutely to the millimeter all the changes that have taken place in relation to the three planes. You can tell whether you have lowered or raised the roof of the mouth, you can tell exactly what tooth has been changed and how much it has been changed in its relation from the three planes.

The photostatic pictures have changed orthodontic photography from a huge joke to a scientific procedure.

Human beings are naturally conservative and more or less afraid of a new idea. We orthodontists must not forget how slow we were in accepting the idea of arch expansion or development, how slow we were in scrapping the old screw bands and 16 gauge alignment wire, how we could not believe that an .030 wire and pins and tubes could move teeth, how we doubted the lingual wire and a .020 finger spring and that we are afraid of biology, glands, and gnathostatics.

Dr. Rohde has presented us with a splendid paper, pointing out very clearly how to proceed to make a careful analysis of the points presented and then how to record them so they will show just what is there.

Read his paper carefully and patiently and try it out on a dozen cases and I am sure that it will afford you as much satisfaction as it has him. Thank you.

Dr. W. R. Humphrey.—For the benefit of the younger members, I believe a gnathostatic cast will give them greater vision in seeing more things in the case, as Dr. Suggett has so well pointed out. Dr. Suggett passed through Denver on his way to the convention and was in our offices Thursday and went over a gnathostatic model with me.

When the case in question presented for diagnosis, I took a gnathostatic impression, and was very much surprised, on putting it on the symmetriscope, to note that the premolars on the left were seven millimeters farther from the Frankfort plane than they were on the right side. I had not noticed this particularly at the time I took the impressions. When the patient returned at the next appointment, I saw it the first thing and could see that the whole contour of his face was in disharmony, something which perhaps should have been observed without the aid of a gnathostatic impression, but one which was forcibly impressed upon me through the use of it. Whether or not the orbital plane as established by Simons is of any value, I believe that such casts will give us greater vision and I urge the use of them.

Dr. A. C. Rohde.—I have nothing further to add. I don't want to take up any more time, but I want to say I thank you for your kind indulgence, and I thank Dr. Humphrey and Dr. Suggett for their kindly remarks.

New York Society of Orthodontists

The next meeting of the New York Society of Orthodontists will be held the morning and afternoon of December 14, 1927, at the Hotel Commodore, New York City.

An unusually large and attractive program has been arranged for this meeting. The morning session is planned especially for the orthodontist, while the afternoon session will be of interest to both the specialist and general practitioner. A nationally known dental practitioner and educator will address the afternoon meeting, and a most important report based on clinical research will also be presented.

A cordial invitation is extended to all ethical members of the dental and medical professions to attend the afternoon session.

William C. Fisher, Secretary, 501 Fifth Ave., New York, N. Y.

HOW CAN ORTHODONTICS HELP PREVENTIVE DENTISTRY?*

By Thaddeus P. Hyatt, D.D.S., F.A.C.D., Brooklyn, N. Y.
Dental Director, Metropolitan Life Insurance Company

THERE can be no doubt that when we know how to live properly and our food shall be in accord with laws of health artificial immunity will be unnecessary. However much we may understand this to be true and however much we may believe in it, we still must know that it will take several generations before this result can be obtained. Today we are confronted with certain actual conditions. It is not a theory we have to contend with, but facts.

What are these facts? I shall give one example. We know that artificial immunity for the prevention of smallpox has proved to be successful in saving the lives of thousands. While many persons may dislike the idea of vaccination, they cannot dispute nor can they deny that in communities which have discarded or ignored this artificial immunity the loss of life from this disease has largely increased. They cannot disprove the fact that after vaccination was practiced in the U. S. Army the percentage of death from smallpox diminished almost to the vanishing point. Artificial immunity therefore has its value and its place. Prophylactic odontotomy is artificial immunity for the prevention of dental caries.

We can all understand that a perfectly sound and healthy person living in proper environment, eating the foods best suited to his system of metabolism and leading a normal life will probably have a sufficiently high resistance to be immune to smallpox and to almost any other disease. We must admit, however, that at the present time and in this country and with our present mode of living, there are very few who can or do possess this natural immunity.

Therefore, while studying and teaching what foods may be considered the best for normal growth, and what may constitute correct habits and hygienic environments so that sound physical health and natural immunity may be secured and maintained, let us not relinquish or discard any of the prophylactic measures for artificial immunity which have proved to be successful. Let us keep them and use them to tide us over to that time when the science of right living and right eating shall be the common knowledge of all mankind and all men will follow and obey it.

May I be permitted to express in the strongest possible terms that I do not believe and have never believed that any one procedure is going to be, or ever can be, the only solution which will solve the question of how to prevent dental caries? There are many different factors involved. There can be no question that diet is one of the important factors. Particularly is

*Read at the Twenty-sixth Annual Meeting of The American Society of Orthodontists, Chicago, Ill., May 2-5, 1927.

this true for the expectant mother, the baby, and the child of preschool age. But back of diet is the question of the life and habits of the ancestors of the mother and the father. The father may have come from sunny Italy, and the mother from England. Back of the mother are generations of beef eaters, jam eaters, etc. Back of the father are generations of eaters of coarse bread, vegetables, etc. What a mixture of conflicting elements in the child. What kind or type of metabolism will the child have?

We must understand that the metabolic system of the esquimaux is different from that of the Hindu. The esquimaux who live largely on meats and fats would soon develop dental caries and other systemic disturbances if made to live on fruits and vegetables. The Hindu, whose ancestors have for generations lived on fruits and vegetables would soon develop dental caries if forced to live on meats and fats. So while doing all we can to advocate a reasonable and well-balanced diet, do not let us pin all our faith and hopes on diet alone.

The same is true for mouth hygiene. Do not think that mouth hygiene is the one thing which will banish all dental caries. Mouth hygiene is one of the factors which will help preventive dentistry and without it we cannot hope to have success. Nevertheless even if mouth hygiene could not claim the prevention of one carious cavity it is still of great value from the health point of view.

Dr. Alexander Lambert, of Bellevue Hospital, New York, on his return from the World War looked over the hospital records and his curiosity was aroused on finding so few cases of rheumatic fever. After studying the records of rheumatic fever for several years past he came to the conclusion that the reason for the great reduction of this illness could only be laid to the increased care people were giving to mouth hygiene.[4]

There are undoubtedly many factors to be discovered, and much to be learned and understood as to what part each may play in the prevention of decay. Over some of these factors we have no control, because as yet we do not know what they are. Over some we have partial or limited control, and over only a very few do we have complete control. We can, by operative procedures, control the vulnerability of pits and fissures. We can also control by the simplest of operative procedures the susceptibility of very narrow grooves.

In the past the large majority of operative procedures have been for the removal of decay. The success of an operative procedure for noncarious teeth for the purpose of preventing decay has yet to be given full justice by our profession.

There is no branch of specialized dentistry so well qualified as the orthodontic to appreciate thoroughly and to understand the importance of early attention being given to all enamel defects. It is these defects which provide the openings in which food débris may collect and decompose.

Professor Bödecker, of Columbia University, has shown that billions of bacteria[1] find ample space in the smallest fissure to lodge and form acid of sufficient strength to decalcify the inorganic salts. These acids are far stronger than is found in the free saliva of the mouth. Professor Bödecker has also

shown that these openings are so small that a single bristle of a toothbrush[2] is too large to be able to clean out the bacteria which are lodged within these crevices. Professor Bunting, of Ann Arbor, has shown that when these openings are closed we shall not find the Bacillus acidophilus in the mouth. On the other hand when there are openings in the teeth and some of them are carious the Bacillus acidophilus are present in the mouth.[3]

That there may be no misunderstanding as to the meaning of the terms used in this paper permit me to call your attention to the following definitions: A fissure is a flaw in the enamel brought about by the incomplete fusing or joining together of the enamel rods along the developmental groove. Pits are sharp dips in the enamel and often have imperfect enamel formation at their base. Deep narrow grooves may have no imperfection in the coalescence or fusing of the enamel rods, but being deep and narrow their shape permits the collection of foods, and as this débris cannot be removed by brushing, strong and concentrated bacterial acidity is formed, which destroys the inorganic substance of the enamel.

The reason for advocating early attention and operative procedure for all enamel defects before decay can be detected is because of the fact that figures, giving the location of carious cavities and fillings in several hundreds of thousands of teeth, show that from 95 to 99 per cent of the areas where pits and fissures are found have decayed. It is also a fact that after the age of thirty we find less than 1 per cent of pits or fissures unfilled or noncarious. This inclines one to the belief that those, who, in the last century advocated the early attention to fissures because they become carious cavities before puberty were very wise in their understanding of the vulnerability and susceptibility of these places to decay.

The development or progress of dental caries in fissures is different from that of approximal caries, because while in the latter there is a greater superficial area of decay, in the former the decay penetrates directly through the enamel to the dentine and then spreads out laterally along the dentoenamel junction. There is little if any enlargement of caries at the point of entrance. It is this principle of fissure-caries which makes them so dangerous to the patient and impossible for the dentist to control by careful watching. The susceptibility of the mesial and distal surfaces to caries is greatly increased by the decay from occlusal fissures which spreads along the dentoenamel junction. Only slight caries is needed in the dentine to affect the pulp and lower the resistance of the other surfaces of the tooth to decay.

Many writers have stated that there are thousands and thousands of molars with noncarious fissures in adults between thirty and forty years of ago. Not knowing what the percentage might be, we made an examination of 1,160 first and second molars in persons between thirty and forty years of age. We found 41 per cent were lost, 42 per cent had occlusal fillings, 7 per cent had carious cavities not filled, 7 per cent had occlusal surfaces that had no cavities and no fissures, and less than 1 per cent had noncarious fissures or places where a fine pointed explorer would "stick" but we could detect no decay. So there are not thousands and thousands of molars in adults which have noncarious fissures.

While we have not examined a sufficiently large number of cases to gain figures from which a definite deduction can be made, still we may gain some idea from the 1000 cases recorded to show the effect on the resistance of the tooth to caries, in other surfaces, when once caries has penetrated to the dentine through occlusal openings. When the proximal surface of a tooth was opposite to a carious cavity in the adjacent tooth and this surface had resisted the influence of caries, we found that over 60 per cent of these teeth had not had caries elsewhere. We found that over 70 per cent of teeth, whose surfaces did not resist the influence of caries but broke down when opposite a carious cavity in the adjacent tooth, had had caries elsewhere which had penetrated into the dentine.

There are quite a few who incline to the belief that many approximal caries originally start in occlusal pits or fissures, particularly in bicuspids. The securing of statistical data on this aspect of dental caries in a scientific manner would be exceedingly difficult. We do know, however, that in many cases decay, starting in an occlusal pit, has been traced down and toward the mesial or distal surface until it was necessary to cut away the mesial or distal wall and make a compound filling. Some believe that 90 per cent of approximal caries in the molar and bicuspid regions have their origin in occlusal pits or fissures. While I am inclined to be doubtful of such a high percentage I am of the opinion that the prevention of occlusal decay will very largely reduce the number of approximal carious cavities.

The three accompanying tables may be of interest as showing the ratio of approximal caries with and without occlusal caries.

TABLE I

Total Number of Persons—2943
Ages between 16 and 25
Total number of 1st and 2nd molars and 1st and 2nd bicuspids—47,974
Total number having approximal caries and no occlusal caries 1125, or 2.9%

TABLE II

Total Number of Persons—608
Ages between 16 and 55
Total number of 1st and 2nd molars and 1st and 2nd bicuspids—8207
Total number having approximal caries and no occlusal caries 274, or 3.4%

TABLE III

Total Number of Persons—554
Average age 21 years

	Total	%
Total number of defective 1st and 2nd molars and 1st and 2nd bicuspids	4459–	100
Total number of teeth with approximal caries and occlusal caries	1546–	34.6
Total number of teeth with approximal caries and no occlusal caries	333–	7.4
Total number of teeth with approximal caries and no occlusal caries	2580-	58.0

That there is an increase in the susceptibility of the mesial and distal surfaces when occlusal caries has occurred should be of great interest and significance to orthodontists, particularly when the moving of the teeth cannot be supposed to increase their resistance to decay. The moving of the

teeth would tend, if anything, to lessen their powers of resistance. Inasmuch as your work necessitates the use of bands you can understand why many carious cavities appear in the mesial or distal surfaces after bands have been placed around the teeth. Caries had already started in occlusal fissures long before the bands were put on. You, however, are held responsible by both the laity and by our profession, if, after the child has been placed in your care and bands have been applied these carious cavities then appear.

When there is a narrow groove which is not deep but from which you can dislodge food débris with a fine pointed explorer, you are warranted and justified, and, in fact to my mind, you are morally obligated to take a fine cut finishing bur and widen that groove so that any brush may keep it clean. This you should do yourself.

Not being an orthodontist I am unaware of what your procedure is. Before cementing on bands I presume you are careful to have the surfaces of the tooth as scrupulously clean as it is possible to make them. I presume you do this yourself, and feel justified in doing so. This being true, I feel you are justified in cutting out narrow grooves. Your patient cannot keep such places clean, and if you are justified in cleaning one surface, why not all?

Please remember that the *free* bacteria, and the free acids of the mouth cannot start decay.

I hope some men from Chicago are present, because there was a man in Chicago whose word carried a great deal of weight, and that was Dr. G. V. Black. Dr. Black wrote many papers on the susceptibility and immunity of teeth to decay. In one of his papers, read in 1900 before the First District Dental Society of New York, Dr. Black made the statement that susceptibility to decay is regional in the mouth. To make sure that I understood his position correctly, I wrote to his son, Dr. Arthur Black, and also to Dr. Kirk, of Philadelphia, and they both replied that my understanding of Dr. Black's position was correct. In the examples given by Dr. G. V. Black he stated that caries is often found in the molar region while there is no caries in the incisor region, and that caries is often found in the upper incisor region with immunity in the molar region. Being interested in dental statistics, I wished to find out what percentage of persons had caries in the upper incisor region and no caries in the molar region.

I do not know how many of you have seen such cases. We made an examination of 5,553 patients in the course of six months, and we did not find one single case. We then went over 5000 charts, and there was not one single case. Yet in all these years this statement of Dr. Black's has never been disputed. I will deny that there are regions of susceptibility in the mouth and regions of immunity. The regions of susceptibility and immunity to decay are confined to certain anatomic formations of the enamel in the teeth alone.

May I call your attention to the fact that the free bacteria of the mouth do not and cannot produce decay? It is only when the bacteria are lodged in certain crevices or locations and remain undisturbed and have time to develop strong acid that decay is started. Having this picture fixed in your

mind, examine the child's mouth with the one object of detecting every place where the enamel is so formed that bacteria can find undisturbed lodgement. Remove such places yourself when they are simple. When they are fissures and you think a filling is needed, use your judgment as to whether you will talk with the family dentist or call the attention of the parent to them. Explain to the mother what preventive dentistry is. Let the mother request her dentist to fill these places. She now knows that no opening is *too small* to fill.

Give the mother one of the printed copies of the resolutions adopted by the American Dental Association. These resolutions state that all pits and fissures should be filled whether there is decay present or not. Let me give you an illustration in regard to that. In New York I went to one of the parochial schools, to make an examination. The dentist in charge told me that many of the children came back from their dentist or from the dental clinics and reported that the dentist said the cavities were too small to fill, —that they did not believe in filling small cavities. This dentist went with one child to a clinic and asked the dentist why he did not fill the small cavities. He said, "My conscience won't permit me."

"Don't you believe in it? Haven't you read Dr. Hyatt's paper?"

"I don't believe in that man at all."

"Don't you know," said the doctor, "that the American Dental Association, the Canadian Dental Association, fourteen state societies and ten local societies have passed resolutions endorsing the filling of fissures?"

"No, I didn't know it."

"That is true."

"Well, that is different. If the profession believes in it, of course, I will do it."

I do not know how it is in the rest of the country, but I have been told by several orthodontists in New York City that they have difficulty in getting the dentists to fill the small openings. If you can hand them a printed copy of the resolutions, they will then feel it is not your idea, or that you wish him to do something that is not recognized as good practice. He can read the resolutions which have been endorsed by all these different dental organizations. I hope it will be endorsed by yours.

Ask the mother to give this resolution to her dentist, or it may be more desirable to deal directly with the dentist who recommended to the mother that she take her child to you. You must use your judgment in every case, but never forget you are responsible for that child once he has been placed in your care, and no friendship, or professional ethics will relieve you of your moral responsibilities, if that child has any pits or fissures left unattended and unprotected.

I would like the men present to realize that I am placed in a very fortunate position. Up until a few years ago the dental profession never had any practical dental statistics showing the ratio of caries in different parts of the same tooth. Preventive dentistry now makes it necessary to secure such statistics. I am with the Metropolitan Life Insurance Company where we have a large statistical force and mathematicians, and I do not present

any figures without first consulting the statistical department. They take our charts and punch cards from these records. When I ask for figures of any kind they take these punched cards, run them through a machine, give the results to one of the mathematicians, and in the course of an hour or two or a day or two, or a week or two, I get the answer. Let me give you one example. I thought it might be interesting to find out how many molars and bicuspids came up into the mouth every month. I went to the head statistician, Dr. Dublin, and told him what I wanted. Dr. Dublin asked me to give him the ages at which the teeth come into the mouth.

A couple of days later the information was sent to my office. There are 2,000 molars and bicuspids coming into the mouth every minute of the twenty-four hours of every day in the year.

Another time I asked, "What are the chances for a fissure remaining noncarious for twenty years?" The reply was that there were 2,500 chances to one that a fissure would decay in less than twenty years. Remember that it is not you who will suffer. It is not you who have those chances against you. Your little patient cannot defend himself. He looks to you to protect him against such odds. Remember the insidiousness of fissure decay. While it is slowly but surely growing larger and spreading out along the dento-enamel junction there will be no external evidence of this progress for a long time. The external opening grows no larger until there is a sudden breaking down of the undermined enamel. When this happens all possibilities of maintaining normal pulp and normal resistance is lost. All chances for practicing preventive dentistry have vanished.

You, as orthodontists, must stand together for the protection of the child and be the champions and upholders of an operative procedure for the prevention of caries rather than for one which only operates to remove decay.

REFERENCES

[1]Bödecker: Bacteria in Relation to Enamel Fissues, Dental Items of Interest, November, 1926, p. 797.
[2]Bödecker: The Tooth Brush in Relation to Occlusal Fissures, Dental Items of Interest, March, 1926, p. 161.
[3]Bunting: Jour. Am. Dental Assn., 1925, p. 383.
[4]Lambert: Jour. Am. Med. Assn., 1920, lxxiv, 993.

DISCUSSION

Frank A. Delabarre.—There is but one point in Dr. Hyatt's paper with which exception can be taken: orthodontists, with few individual exceptions, for obvious reasons, cannot undertake to do operative dental work on pits and fissures.

On all other points our specialty can and will give hearty support.

Every orthodontist knows of the great need for more adequate attention to children's teeth in order to prevent the loss of the deciduous teeth, which is so often a serious complicating cause of malocclusion.

The adoption of resolutions at the Atlanta meeting in 1925 clearly defined our position on this point.

Our whole field of endeavor becomes an illogical gesture the moment the physical condition of the mouth is neglected. Most mouths are neglected before we see the patient.

The crux of the underlying principle of prevention lies in early, systematic and adequate attention to initial defects, such as pits and fissures, Hyatt's prophylactic odontotomy. His

figures, based on examination of adults say that "the chances are 2500 to 1 that every fissure will decay."

Dr. Edward F. Sullivan of Boston, in a preliminary report on a survey of children (Table I) shows that "89+ per cent of all pits and fissures are already decayed at the average age of 5."

Our aid, in this cause, is asked for, and the suggestions given are good, but not strong enough.

Our relations with the profession and the public, and the growing importance of our work, impart to our influence a great strength, which should be *actively* used.

We should enter the fight for children's dentistry and exert all of our influence to force the adoption of its practice on the profession principally for the tremendous health influence it will have on the child and incidentally as an aid to our own work.

It is our duty to call to the attention of the parent the widespread acceptance this idea has had in the profession.

Fifteen states, three national bodies, and the Federation Dentaire Internationale, besides many local societies have given unanimous support to the resolutions, a copy of which is submitted with this discussion.

TABLE I

1192 DECIDUOUS MOLARS

One hundred and forty-nine children of the Forsyth Infirmary, average age 5 1/12 years, recently had their deciduous molars examined for pits and fissures with the following results:

Teeth not erupted	10	0.8%
No defects	180	15.+
Defective	1002	84.+
	1192	100.

The defective teeth were classified:

Noncarious pits and fissures	111	9+%
Carious pits and fissures	203	17+
Cavities	284	23+
Fillings	194	16+
Loss through caries	210	18+
	1002	84+

All defective teeth originally had "noncarious pits and fissures." That is the logical time to prevent the almost inevitable disaster.

SAVE THE FIRST TEETH.
SAVE THE TEETH FIRST.

We all know the difficulty in having our patients properly attended to by the dentist before and during orthodontic operations.

A frank official formulation of our requirements and position on the question of maintenance of mouth health in children would do much to avoid friction between the three interested individuals, the parent, dentist, and orthodontist.

Copies of this should be sent to the family dentist of every case handled.

If cooperation is not secured then, in self-defense, it should be submitted to the parent.

In that way we have been fair to the dentist and fulfilled our moral obligation to the child.

It is also urged that the Atlanta resolutions be sent out to all organizations mentioned in the resolves. (Copy is attached.)

The Dental Teachers' Association is seriously considering the development and inclusion of "Children's Dentistry" in the curriculum and our support would have weight. I would say thirteen of the forty-two dental schools on this continent already have courses in children's dentistry.

The draft referred to is hereby submitted for action at an appropriate time.

RESOLUTIONS ADOPTED BY THE AMERICAN SOCIETY OF ORTHODONTISTS
Chicago, May 4, 1927

The American Society of Orthodontists subscribes to the following affirmation of items and principles relating to Dental Health.

WHEREAS, The correction of malocclusion is primarily a health measure: and

WHEREAS, The only solution of Dental Health, both locally and in its relation to general health, lies in the prevention of oral disease: and

WHEREAS, Dental prevention is effective in inverse ratio to the age of the patient, Children's Dentistry is the logical field of preventive measures: and

WHEREAS, Orthodontists need the complete cooperation of the dentist to insure and maintain Dental Health before and during orthodontic procedure: and

WHEREAS, The principles of prevention, listed herewith, have been endorsed by fifteen State Dental Conventions, three National Dental Associations, and the Federation Dentaire Internationale:

(a) Proper attention to initial defects.
(b) Particular care and attention to all pits, fissures, and grooves before caries appears.
(c) No cavity is too small to fill.
(d) The deciduous teeth should have the same care and attention as the permanent ones, as their maintenance in health is essential to proper development of adult occlusion: and

WHEREAS, Disregard of these principles and practices of accepted dental teachings constitutes a transgression of professional obligation to the patient, and a serious handicap to orthodontic procedure: Therefore be it

Resolved, That this declaration of policy is the unanimous expression of the belief of this organization, whose members are called upon to uphold it in all their relations with the Dental profession, and the public: and be it

Resolved, That copies of these resolutions should be displayed in each orthodontic office and sent to the dentist responsible for the care of the patient, immediately upon acceptance of the case: and be it further

Resolved, That this action be given publicity in professional journals and copies sent to the secretaries of various state, national, and international dental organizations and to dental school associations.

RESOLUTIONS ADOPTED UNANIMOUSLY BY THE AMERICAN SOCIETY OF ORTHODONTISTS
Atlanta, Georgia, April 14, 1925

WHEREAS, Many cases of malocclusion are seriously complicated by avoidable physical dental defects early in life: and

WHEREAS, Orthodontists would welcome the elimination of all such complicating causes: and

WHEREAS, It is believed that the best possible future development of dentistry must be along the applied principles of prevention:

Be it Resolved that the American Society of Orthodontists make this unanimous appeal to the dental profession at large to use all their influence to bring about as speedily as possible the consummation of such development, through individual effort and the adoption of a revision and balancing of dental curricula that will emphasize the teaching and practice of pedodontia.

And be it further Resolved that copies of this resolution be sent to the Secretaries of the American Dental Association, the Pedodontia Association, the American Association of Dental Schools, and to the Deans of American Dental Schools, and to the journals of the dental profession.

RESOLUTIONS ADOPTED BY THE MASSACHUSETTS DENTAL HYGIENE COUNCIL

WHEREAS, Up to the present the attention of Dentistry has been centered mainly on the work of restoring lost dental tissue, and

WHEREAS, The only hope of real progress lies in the prevention or early control of dental diseases, and

WHEREAS, Prevention, to be effective, must be applied early in the life of the individual—and early in the life of the tooth; be it

Resolved, That Dental Service must begin early and be systematic and periodic in order to obtain the maximum of prevention with the minimum of operative work, and to educate the child properly in habits of oral hygiene; and be it

Resolved, That in the aim to attain prevention of systemic and dental disease:

(a) No defect is too slight to receive definite attention.
(b) The temporary teeth should receive as much care as the permanent ones in order to promote the proper development of the jaws and head, and to maintain function.
(c) Particular care and attention should be given to developmental pits and fissures, whether occurring in primary or secondary teeth, or whether decay is or is not present; and be it

Resolved, That the Dental Hygiene Council of Massachusetts declares for the principles and practice of Children's Dentistry, and maintains that the most effective dentistry that can be done for any individual is service rendered between the second and fourteenth years of age; and be it

Resolved, That this Council calls upon all dentists to uphold these fundamental principles, and to do everything possible to promote the practice of Children's Dentistry by professional and public education, and in public and private practice.

MARCH 29, 1926.

Dr. L. M. Waugh.—Mr. Chairman and Fellow Members: Perhaps someone else was supposed to second the motion that we adopt this resolution; if so, I don't know of it, but I do want to second it and say a word for doing so, knowing that we have something else scheduled in just a few minutes.

I think the topic that Dr. Hyatt has brought before us today is the one most important topic before the dental profession. I have had the privilege of knowing of his work from its very beginning. Through his suggestion, I was invited with a few dentists to meet with the officers of the Metropolitan Life Insurance Company in 1914 for the purpose of discussing the advisability of their instituting a prophylactic service for their employees. As a result of that, Dr. Hyatt gave part of his time to it and part to practice until a year or so ago. This shows evidence of the finest, most accurate type of statistic research with which dentistry has been favored. It has been brought out not at the expense of the dentist, but at the expense of a great organization resulting in benefit to the dental profession and humanity.

A discussion of these resolutions has come up before various societies in our section of the country. At first I was rather opposed to societies going on record as passing resolutions of the sort, but two years ago I was won over by seeing the advantage to a cause in which we believe. I served on the committee of the New York Academy of Denistry which revamped the resolutions which Dr. Hyatt requested be adopted. They were then adopted and resulted in a great deal of good. It reaches into the office and practice of each one of us.

I will not take time now to tell you to what practical use we have put this in my own office. I can only say that the result has been wonderful in improving the condition of the dental care given to patients, and also, in nearly all instances have promoted cordial relationships of practice between my office and that of the general practitioner.

Dr. Harry E. Kelsey.—We are favored with Dr. Hyatt's presence. We failed to get him in Maryland. We invited him to address the Maryland State Dental Association, but he could not accept because that meeting is going on at the same time that this is.

I want to say, after hearing Dr. Hyatt, and I have heard him before, we do not intend to give up our effort to get him in Maryland. He would not have given the same paper, but the substance of it would have been very beneficial to us. It would have set us on the road if we could have had him there before our men, and our state society is going to have the benefit of Dr. Hyatt's talk and experience, if we can bring it about.

President-Elect Ellis.—Is there any further discussion? If it is the order and wish of the Society, we will take action on the resolution which I believe has been moved and seconded formally. Is there any discussion on the resolution? If not, I will present it. The resolution has been formally made and it is in regular form on the Secretary's desk. All in favor—

Dr. L. M. Waugh (interrupting).—There is one thing I want to say. I want the resolution corrected, Dr. Delabarre, in one respect. "The American Society of Orthodontists *recommend* this."

President-Elect Ellis.—All in favor of the passage of the resolution as corrected will signify by saying "aye"; opposed "no." It is carried.

If there is no further discussion on Dr. Hyatt's paper, we shall ask him to close the discussion.

Dr. Thaddeus P. Hyatt.—Thank you for passing and adopting those resolutions. I feel that dentistry is becoming a part of all public health work.

Chicago Dental Society

The Annual Midwinter Meeting and Clinic of the Chicago Dental Society will be held at the Drake Hotel, Chicago, January 24, 25, 26, 1928. Dr. Arthur D. Black is chairman of the Program Committee.

All members of the American Dental Association are cordially invited to attend this meeting.

Southern Society of Orthodontists

The annual meeting of the Southern Society of Orthodontists will be held at Hotel Belvedere, Baltimore, Maryland, on April 27 and 28, 1928. A cordial invitation is extended to all ethical members of the dental and allied professions.

Oren A. Oliver, Sec'y.-Treas.,
1101 Medical Arts Bldg.,
Nashville, Tenn.

Clinics

THE APPLICATION OF LIGHT RESILIENT ARCHES IN CONJUNCTION WITH A SPECIAL LOCK (CLINIC)*

By Dr. Edward M. Griffin, Portland, Oregon

A SYNOPSIS of: (a) The Fundamental Principles Involved. (b) The Technic of Arch Construction. (c) The Mechanical Features of the Griffin Lock. (d) Illustrations of Results Obtained.

The purpose of orthodontia, as explained by Dr. A. LeRoy Johnson, is to assist Nature in the development of the structural elements of the jaws, and so to harmonize the surrounding and supporting structures of the teeth that the whole mechanism will constitute an assemblage of parts best suited to the functional activities; i.e., the adjustment of the organism as a whole.

To all actively engaged in its practice, it is apparent that orthodontic treatment in the majority of cases involves the problem of development, that is, the condition of the mouth and associated structures present a need of inducing cellular activity for the ultimate increase or decrease of cellular substance, or for a rearrangement of the parts to so harmonize all the structures concerned for the production of a masticatory apparatus best suited to the economy of the organism as a whole. Our work involves, then, the treatment of cases in which the developmental process of the jaws has been disturbed. Abnormality is our field, and we realize as do all members of the healing art, that Nature really corrects the malformations, in response to our aid during which we remove the inhibitions, thereby permitting the inherent life properties of the living tissue cells to build for that beautifully balanced structure we conceive as normal.

The remarkable strides that orthodontia is making in the light of present day biologic knowledge and with the greatly increased interest in the study of the physiologic laws involved is encouraging after a period of years during which the thought and relative importance of mechanics held full sway. We now realize that we are dealing with living tissues, a complex of vital cells and that we must consider mechanics secondary in importance to the many sciences involved in the study of tissue changes. Nevertheless, in view of the fact that the problems of nutrition have not been mastered, nor have we learned as yet to treat all cases in the incipient stage by such natural procedures as muscular exercises, etc., it does of necessity behoove us to give due consideration to the mechanics we employ for a study of their effects upon the tissues.

Contemporary writers agree that living bone is the most labile, the most plastic structure of the whole organic complex. From the very nature of this the most highly specialized of the connective tissues, it is apparent that the maxillary bones may be visualized by the orthodontist as a delicate structure composed of millions of cells which are responsive to the most delicate stimuli

*Clinic given before the First International Orthodontic Congress, New York City, August 16-20, 1926.

and that such stimulation will start a flowing, so to speak, of the cellular elements for a rearrangement likened to the molding of any plastic material.

Oppenheim came to the conclusion that bone tissue, be it compact or cancellated, reacts to pressure by a transformation of its entire architecture, the newly formed bony spicules being arranged in the direction of the pressure. *This transformation results only upon the application of very light physiologic like stresses,* should the stress used be considerable, there will be an absence of such bone formation and the blood vessels of the periodontal membrane appear to suffer degenerative changes.

The writer is an ardent advocate for the application of delicate resilient spring pressure from a mechanical standpoint in the production of all tooth movements. It seems of vital importance that operators in the orthodontic field should at all times watch closely the tone of the investing tissues of the teeth which are being subjected to any mechanical force. The operator should sense quickly the borderline between tissue stimulated to a point of producing cellular activity and tissues in a state of inflammatory reaction. Many orthodontists are now convinced that both excessive stimulation and mechanical fixation are conducive to atrophy of tissue. It is the clinical observation of the writer that there is a considerable range in the degree of force which *can* be applied in the movement of teeth before permanent injury may result and the amount of force which *should* be applied for a reaction which will result most favorably as we influence the metabolism of cellular structures. Also, the more severe the maldevelopment the *lighter* is the force needed to produce a greater stimulation, physiologically, for the slightest tendency toward irritation in severe conditions only defeats our purpose in attempting regeneration of tissue. It is the experience of the writer that a period of supervision is desirable in establishing a final balance of the teeth by employing only a portion of the appliance used in active treatment as a retainer; however there is no separate retaining period or appliance necessary, and the treatment might be compared to the gradual discarding of crutches.

In consideration of appliance-construction involving the application of light resilient arches in conjunction with a special lock; the following explanations and claims concerning its efficiency for inducing cellular activity are hereby offered by the writer after several years orthodontic practice with their use.

The arches are constructed of Baker and Company's Alloy "J" wire, ranging from 0.018″ to 0.025″ in diameter. The appliance is constructed differently to suit the requirements of the individual case; both as to design and gauge of respective arches—it is also changed from time to time according to the needs of the case as it changes in its development toward completion. In this manner the minimum amount of appliance mechanism is in the mouth at all times according to the use being made of it.

The light resilient arch, being nonrigid, is made to conform to the size and shape of the true dental arch, and is so flexible that it can be readily sprung to the size and shape of the arch as it is, with the teeth in malocclusion. It is so resilient that it will, when properly locked to the teeth, carry

them toward their proper places. It is necessary, as adjustments are made during treatment, to reshape the arch, each time conforming it to the ideal as conceived by the operator. The advantage is that the small gauge wire can be adjusted so that it will work through a long range of distance over a long period of time without at any time exerting more than a very slight pressure. The fact that only a slight pressure is transmitted to the teeth from the moment the adjustment is made is shown by the manner of placing the spike in the lock by aligning the arch wire under tension with only a pen grasp of an instrument against the block while the spike is placed to retain the pressure. It will continue to exert a light, even and continuous force which permits the extensive movement of teeth without soreness.

Arch wires of very small gauge are by no means safe in the hands of the novice or student but their scientific application will prove efficient in the absolute control of anchorage if the operator will but take into consideration the action of the rebound or reactive forces and make those forces work *for* him instead of *against* him.

It is not possible within the confines of this synopsis to present a detailed illustration of the various combinations which can be employed by small spring wires in the control of anchorage, however the case reports following will present evidence conclusive whether or not anchorage has been controlled in various types of cases. Various combinations of group anchorage can be worked out in which one pits one group in movement against another group, having all teeth move through the expenditure of force toward positions of normality.

The writer presents the following principles in regard to the light resilient arch wire. It permits of three principal classifications of force control.

1. Simple spring pressure or the elasticity of flexion applied to one or several teeth, simultaneously, the reactive forces pitted against a group of teeth whose positions are nearly normal.

2. The same pressure applied to one or several teeth, the reactive forces pitted so that they act as active rebound forces to move the virtually anchorage teeth to positions of normal.

3. The elasticity of torsion in which the resilient arch transmits through its substance the rebound forces to certain teeth for the application of root control.

4. The combination of the above applications.

Anchorage in its true sense does not exist in orthodontia. Millions of cells are always disturbed in any application of force and it is the problem of the orthodontist to so assemble the forces that the *resultant effects* will produce a normal structure in development as he visualizes his case in the completed stage.

This lock was designed by the writer six years ago and has been used exclusively in controlling the application of light resilient arches with results as shown in the following selection of models. This selection is made to give particular attention to the bone development attained during treatment.

The purpose and object of this lock, known as the "Griffin lock," is to provide simple and efficient means of employing small gauge wires in arch construction, combined with an attachment which, through its locking device, permits of the transmission of light, even and continuous forces to the teeth, through the elasticity of flexion and through the elasticity of torsion. The elasticity of torsion is particularly applicable in root control.

The Griffin lock is spherical in shape, and it is so constructed as to minimize the elevation of the block. A spiking arrangement is provided for locking the apparatus or device, this spike being made tapering in form and having provision made in the block to permit the same to be held in place at the location of the head of the spike, by an undercut or recess made in the block for that purpose. The recess cut on the upper surface of the block permits the counter-sinking of the head of the spike, thus preventing any projection from the smooth surface of the block, also this recess prevents any turning of the spike upon its axis in the locked condition, eliminating any chance of the tapered point or of the head of the spike becoming an irritating agent.

When a change in pressure is required upon the arch wire the bent portion of the spike is removed on the smaller or tapered end, by removing the head of the spike, which is cut at a bevel on the under surface near the end, this bevel readily engaging a specially designed hook instrument. The head of the spike is thus raised and the spike itself loosened, permitting the loosened end, which had been closely cleated to the seat, to be cut free by a specially designed cutting instrument. The entire spike is then easily removed by using the pin grasping pliers.

Another advantage of the lock is accomplished in the method of securing the arch wire to the block by means of drilling the block and the arch wire and soldering of the same in place by the use of a solder having a low fusing point, or one that melts at a low temperature, for by the use of the same a joint, or welding is accomplished without drawing the temper in the arch wire.

These objects are attained by the mechanism illustrated in the accompanying drawings,* in which:

Fig. 1 is a front view of the upper jaw with the arch wire in place and clearly illustrates the lock in place and the means of attaching the arch wire to the same.

Fig. 2 is a cross section view taken on line *A-A* of Fig. 1 in this view the arch wire and block are removed from the seat and a desired tension has been placed in the arch wire before the same is again placed in position, in the seat of the block, and the spike placed therein. The dotted position that the tooth will occupy when the adjustment is completed is shown in this view.

Fig. 3 is a general plan view of the block before the same had been put in place upon the arch wire.

Fig. 4 an end view of the same.

Fig. 5 is a plan view of the block in place upon the arch wire.

Fig. 6 is a cross section view of the same taken on line *B-B* of Fig. 5.

*These drawings are illustrative only of mechanical construction in sectional views; they do not illustrate the proper assembling of lock and arch construction to conform with physiologic requirements of treatment.

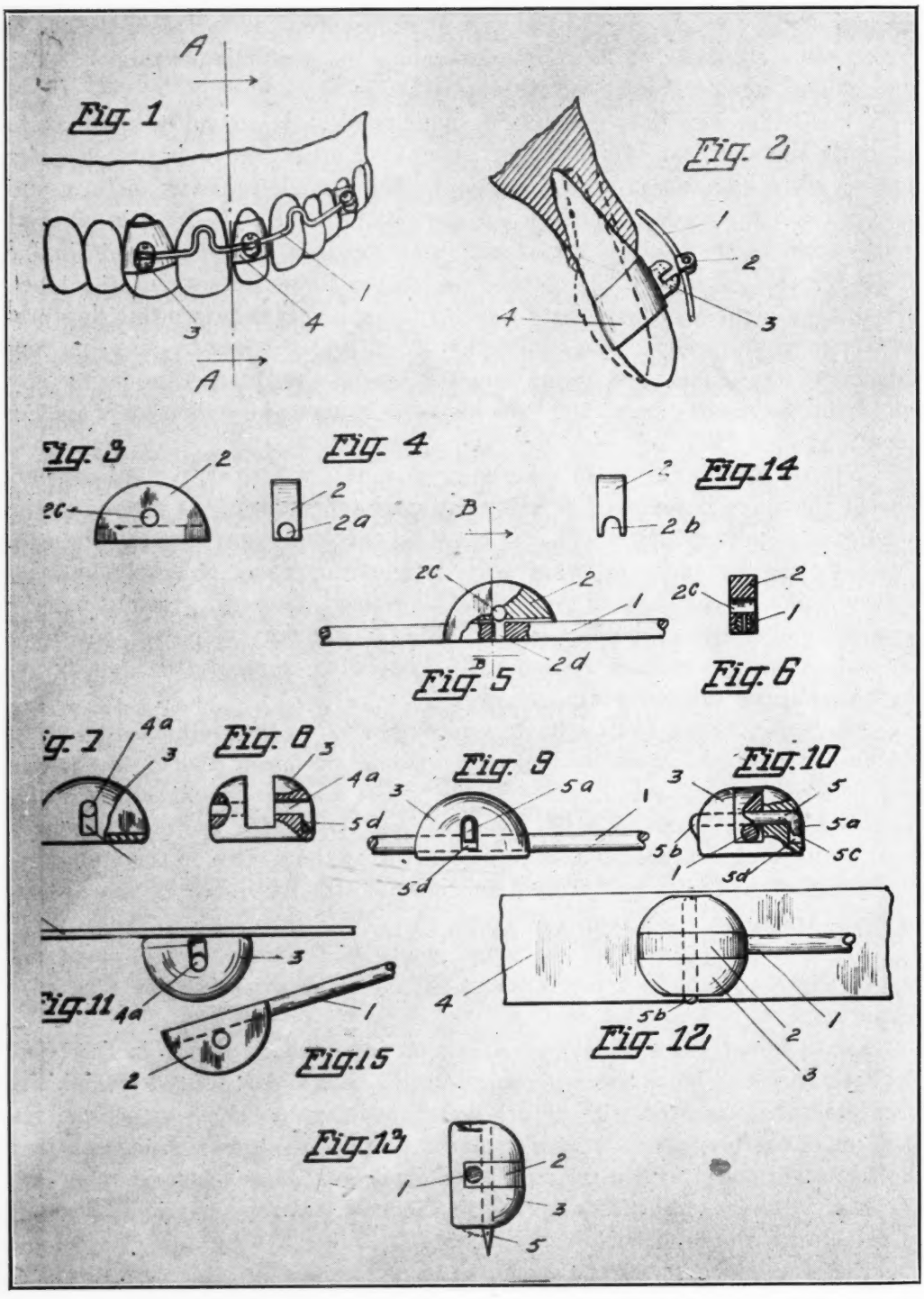


Fig. 1
A
A
1
3
4
Fig. 2
1
2
3
4
Fig. 3
2
2c
Fig. 4
2
2a
Fig. 14
2
2b
B
B
2c
2
1
2d
Fig. 5
2c
2
1
Fig. 6
Fig. 7
4a
3
Fig. 8
3
4a
5d
Fig. 9
3
5a
1
5d
Fig. 10
3
5
5a
5b
5c
1
5d
Fig. 11
3
4a
1
2
Fig. 15
4
5b
2
1
3
Fig. 12
Fig. 13
2
1
3
5

Fig. 7 is a plan view of the seat partially broken away to more clearly show the construction of the same; in this view is also shown the recess into which the head or upper end of the spike is fitted which makes the same finish flush and at the same time prevents the spike from turning about its axis.

Fig. 8 is an end view of the device shown in Fig. 7 and is partially broken away to show the recess for the head of the spike to seat in and the hole through which the spike passes.

Fig. 9 is a plan view of the arch wire, block, seat and spike assembled.

Fig. 10 is an end view of the same partially broken away to show the assembly, the head of the spike seated in the recess and the bending of the lower tapered end to lock the same in place, were it not for the seat or recess into which the head of the spike engages itself, it would be permitted to turn about on its axis, and in so doing the point could take a position that would be very objectionable to the patient, such an action is prevented by this recess or seat which engages the head of the spike.

Fig. 11 is another plan view, showing the seat attached to the band around the tooth.

Fig. 12 is a front view of the assembled seat, block, arch wire, and spike; this view is one of a terminal or end attachment in place attached to the band that is to pass and encircle the tooth to which it is to be attached.

Fig. 13 is an end view of the assembled seat, block and spike, showing the spike in place and the head of the same seated in the recess to hold it, illustrating the tapered or lower end of the spike not as yet bent to place, the dotted position of the point show the same in its final position on the lower side after having been bent to its retentive position.

Fig. 14 is an end view of the block that is to be attached to the arch wire at a location other than at a terminal or end of the wire, and is shown slitted at the back for admission onto the arch wire.

Fig. 15 is a plan view of the block in place on the arch wire as attached at the terminal end of the arch.

Similar numerals refer to similar parts throughout the views illustrated.

No. *1* is the arch wire to which the block *2* is made fast, this being accomplished by the drilling of a hole or by other means as shown at *2a* in in Fig. 4 provided the block is to be used as an end terminal, it is slit as shown at *2b* in Fig. 14; after the block had been put in position upon the arch wire a hole *2c* is made in the block and the arch wire and the same is then soldered in place by the use of a solder having a very low fusing point, thereby accomplishing the welding without drawing the temper from the arch wire; the object of soldering the arch wire to the block both at the hole or opening *2c* and *2d* is to make possible the removal of all surplus metal at the base of the block, and to eliminate elevation and to make possible a straight line of the arch wire and the base of the block, this is very essential and important in the practice of orthodontia for it has to do with the comfort of the patient while wearing the corrective appliances in the mouth, and reduces to a minimum the projection of the arch wire from the teeth.

No. *3* is the seat, which is attached to the band *4* that encompasses the teeth and holds the same in place. The elimination of the elevation at the back of the block, makes possible the location of the spike hole *4a* to be placed in the approximate center of the radius of the seat, the location of this hole was formerly near the outer edge of the same and can only be placed as shown in Fig. 7 and Fig. 11 by the elimination of the elevation as heretofore described. The location of the hole *4a* has a further advantage of making possible the rounding of all edges or corners of the seat, thereby further adding to the comfort of the appliance when in position in the mouth.

No. *5* is the spike which is made tapered or pointed on its lower end to permit of easy placement, and which has a head upon its upper end that permits of its seating in the recess within the seat block, this serves as a dual purpose, first the head fitting into the recess permits the same to finish flush with the top of the seat and secondly prevents the spike from turning about upon its axis. The recess into which the head *5a* seats is somewhat longer than that of the head, and the head has a beveled edge on its outer end near the upper side as shown at *5c* and the additional length of the recess over that of the head is shown at *5d* the object being, to give access to the hook instrument for catching the bevel under the end of the spike. The tapered end of the spike is cleated closely to the seat by a pair of specially designed angle-beaked pliers.

American Association of Dental Schools

The fifth annual meeting of the American Association of Dental Schools will be held at the Mayflower, Washington, D. C., March 26, 27 and 28, 1928. DeLos L. Hill, Secretary, 1206 Medical Arts Building, Atlanta, Ga.

Montana State Board of Dental Examiners

The next meeting of the Montana State Board of Dental Examiners will be held January 9-13, 1928, at Helena. For further information address

T. P. Regan, Secretary, Helena, Mont.

THE SUBIRANA THERADONTOGRAPH*

By Luis Subirana, Madrid, Spain

I HAVE given this name to this apparatus of my own invention which is intended to imitate all the anomalies of occlusion, and which can also be used for the demonstration of some corrective elements.

Without guaranteeing the philological construction of the word, it seems to me that the three bases on which it is formed indicate clearly that it refers to an apparatus to describe graphically the anomalies of the teeth.

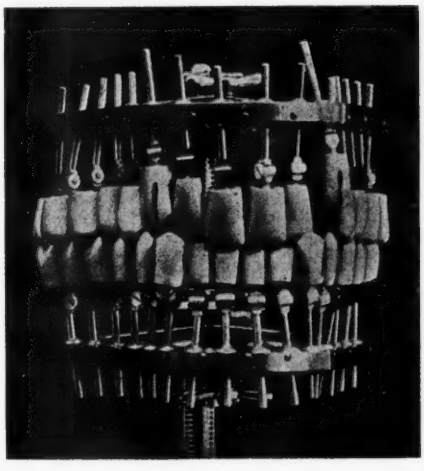


Fig. 1.

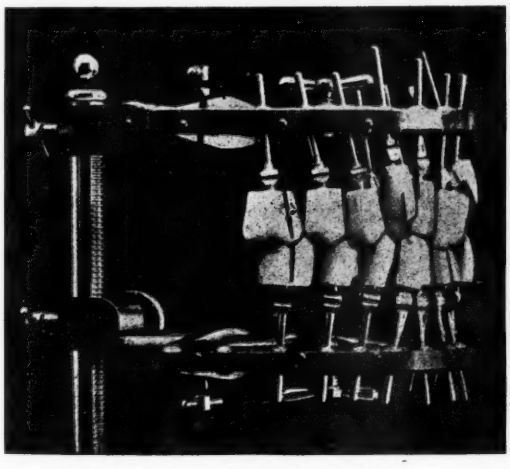


Fig. 2.

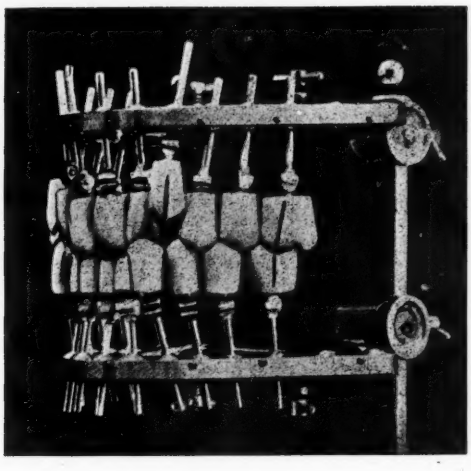


Fig. 3.

Figs. 1, 2, 3.—Normal anteroposterior relation of arch.

Basing myself on very simple mechanical principles, I have succeeded in imitating with this apparatus the abnormal positions of teeth, as perfectly as it is possible to do when dealing with mechanics as complicated as those of the 32 human teeth. The forward, lateral, backward movements, etc., that

*Clinic given before the First International Orthodontic Congress, New York City, August 16-20, 1926.

is to say, the 7 deviations, simple and compound, as well as collective movements can be simulated by its means.

As is obvious, its principal object is educational and auxiliary, meant for schools, societies and congresses, since not only a case of dental malocclusion in a mouth of natural size cannot be seen at a certain distance, but it may be that at a certain moment one has not at one's disposal what is needed for a demonstration.

We now see the "Theradontograph" presenting the teeth in a state of normal occlusion. The apparatus rests on a strong stand, two rising pieces support the maxillary and the mandible, which, with the aid of a serrated pinion can be worked upwards and downwards revolving on a ratchet fixed

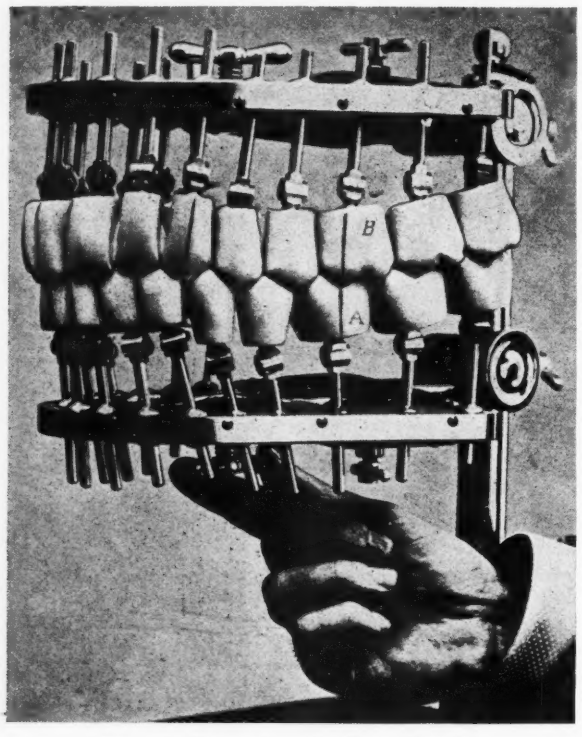


Fig. 4.—Normal occlusion. Profile.

on the main support and at the same time can be inclined towards the right or left, forwards or backwards.

I created the unnatural upward movement of the maxillary only for purpose of demonstrations of course.

I succeeded in imitating the various simple and compound movements of natural teeth by the infinite simplicity which will be seen, with the aid of the ball and socket joint principle, and it is right that I should state here that I got the idea from the headrest of the Willkerson Chair which by means of a screw and transmitted pressure controls the movements and stability of various pieces at the same time. But I could not apply the same mechanism as I wished and required to move and immobilize easily and rapidly 16 upper and 16 lower teeth, I then conceived the division of the

articulating ball in two halves, which, with the juxtaposition of two platens carrying on the exterior the sockets for the two halves of the ball complete and articulation; a central screw in both maxillaries controls the movement or stability.

But as my work progressed, I found that an independence of movement was necessary, between the root of the tooth and the crown; this was a grave question which placed an obstacle to my efforts to render the use of the "Theradontograph" easy and rapid, specially required for teaching purposes, but recently the ball and socket principle came to my help: by means of one

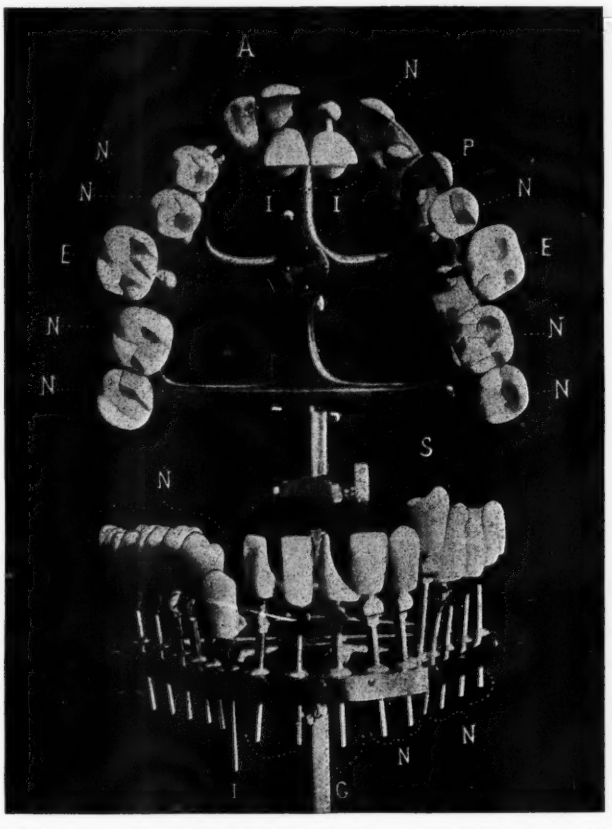
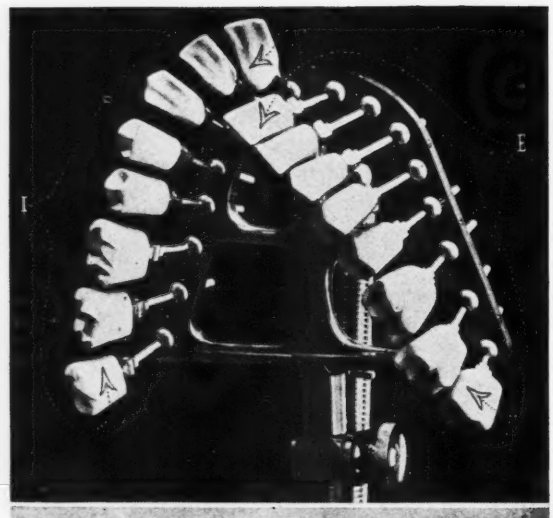


Fig. 5.—The letters indicate: *E*, extraversion; *I*, intra or infra; *A*, anterior; *P*, posterior; *G*, torsion; *S*, supra; *N*, normal.

screw only, I obtained the mobility and immobility of 32 lower and 32 upper pieces through indirect pressure.

It will be readily seen what difficulties I had to contend with, for the most precise and perfect construction work was required to obtain that a central screw acting on the platens should exercise an equal pressure on the 16 pieces at a distance of 15 cm. and at the same time that through a rod from the platens an indirect pressure should be exercised to another 16 sets of ball socket joints corresponding to the crowns. I obtained this by cutting a concave cylinder in the two halves of the spheres and passing through it a steel pin cut longitudinally in half and shaped into a ball at one end. Its mechanism is opposed to that of a pair of scissors; when the two halves of the

Fig. 6.



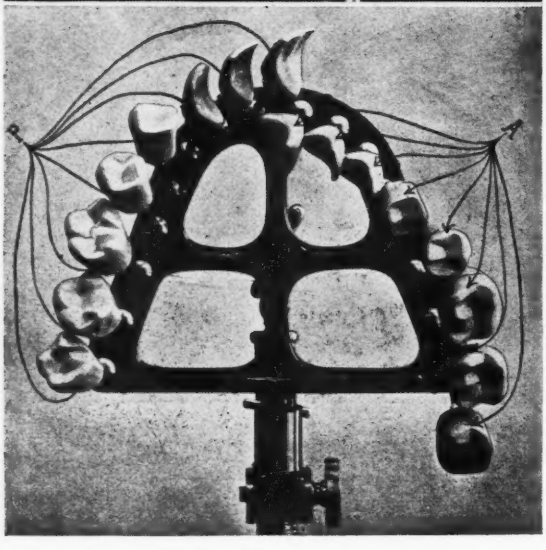


Fig. 7.

Figs. 6 and 7.—Surfaces of teeth. *I*, internal; *E*, external; *P*, posterior; *A*, anterior.

pin open the ball closes, and on the contrary, when they close, the ball opens. opens.

To conclude we can say: The central screw brings the platens together, these in turn press on the two halves of the ball and join them; in joining the latter press on the sides of the steel pin, with the result that the ball at

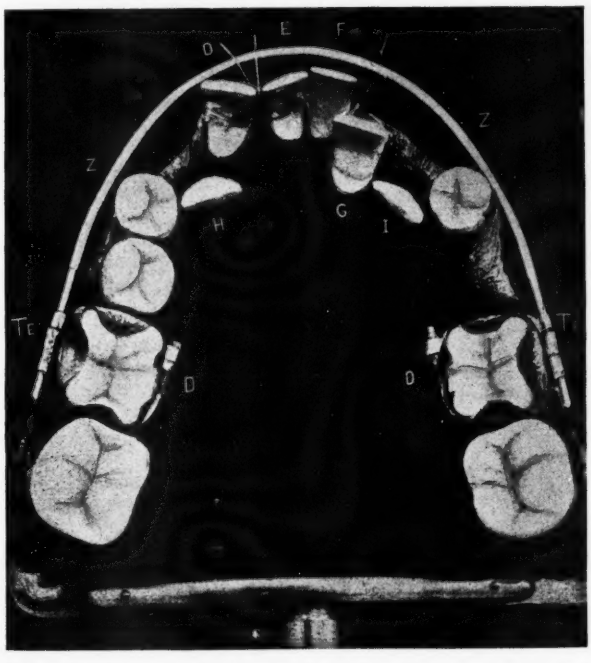


Fig. 8.—Mandibular arch in the third view. The incisors, *D E*, with bands provided with small hooks to right and to left. *Z Z*, arch of expansion, regulation, or retention. *D D*, bands with lingual screws. *Te Te*, bands with buccal tubes.

Fig. 9.—The index finger and the thumb compressing the teeth and the expansion arch in such manner that upon release of the pressure, the teeth are pulled upon by the elasticity of the arch.

the end opens, pressing on the sides of the cup lodged in the center of the crown, and locks it.

The apparatus is manufactured in Spain under my supervision, and the set of 32 teeth made in my laboratory, firstly modelled in composition and then reproduced as you see in white rubber.

CASES SHOWING PROGRESSIVE CORRECTION OF A HABIT WITHOUT THE AID OF APPLIANCES AND PROGRESS OF A MUTILATED CASE. TREATMENT BEGUN AT THE AGE OF TWENTY-EIGHT. (CLINIC)*

By Maj. Harry Deiber and Maj. Lowell B. Wright, Washington, D. C.

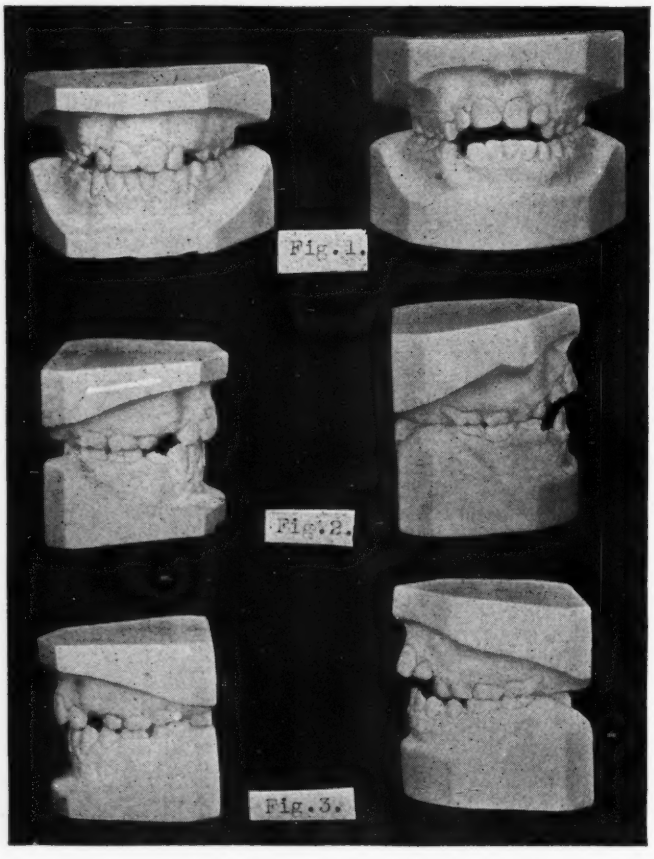
CASE 1.—We wish to present the treatment of a habit case.

Patient, aged ten years. Female.

Habit—thumb-sucking.

Malocclusion typical of thumb-sucking, see Figs. 1, 2, and 3.

In treating this case we first constructed a cast aluminum shield (Fig. 4) to be worn between the teeth and lips at night. This form of treatment was



not successful in this case and the use of the shield was discontinued after about two months.

We then constructed a wire sleeve (Fig. 5) to be worn on the arm over the night garment.

*Published by permission of the Surgeon General.

Given before the First International Orthodontic Congress, New York City, August 16-20, 1926.

This wire sleeve was in use for about one year and the results as shown in Figs. 6, 7, and 8 are very satisfactory.

The idea of the wire sleeve is not original and our object in showing this case is to demonstrate the fact that it is not necessary, in every case of malocclusion, to place a mechanical appliance within the mouth.

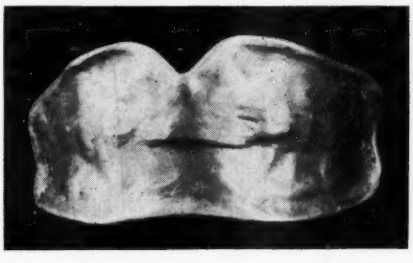


Fig. 4.

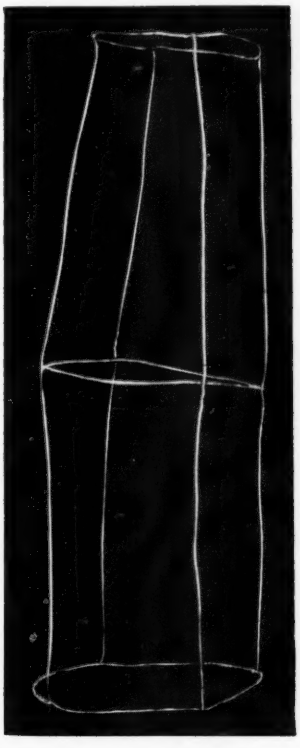
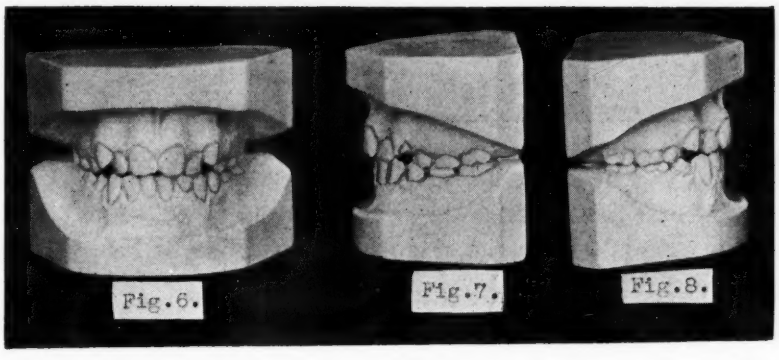


Fig. 5.

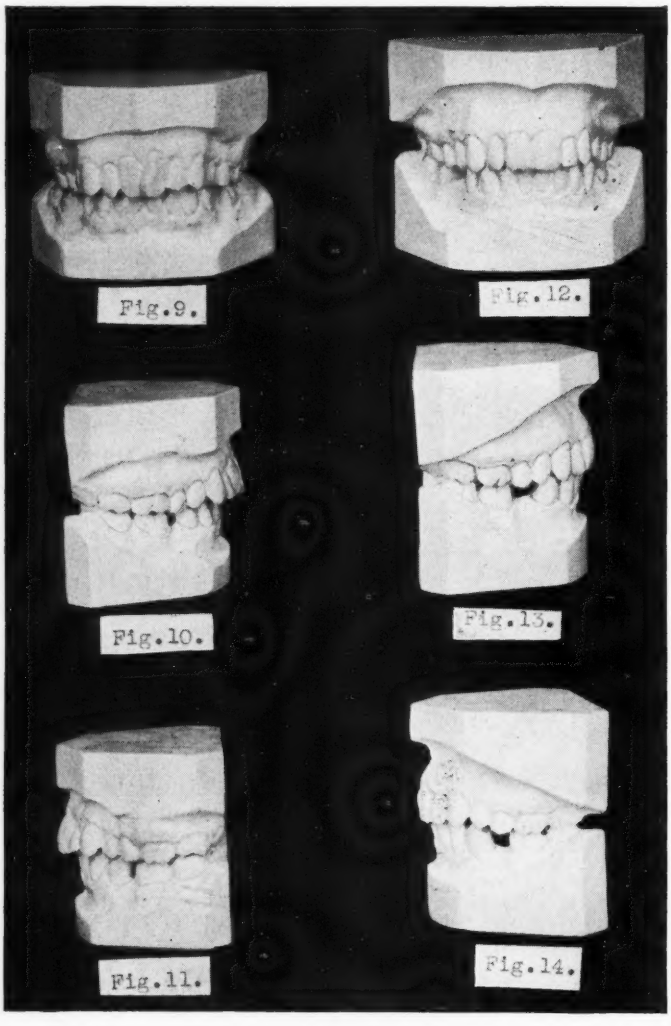


Case 2.—We wish to present a mutilated case. Age twenty-eight years. Female. The mandibular second premolars are missing. Anterior teeth in mandibular arch were drifting distally.

Upper anterior teeth in torsocclusion and periodontoclasia present (see Figs. 9, 10, and 11).

Appliances used in treating this case were a Mershon upper and lower lingual arch, and Lourie high labial on the upper.

Apical root movement was accomplished on the mandible with a labial alignment wire, spurs and ligature wire.



Patient at present time is wearing soldered upper and lower lingual wires with bands on the molars.

While this case is still in the retention period, we believe that the results as shown in (Figs. 12, 13, and 14) have justified the attempt at correction.

CAST HAWLEY RETAINER WITH ATTACHMENTS SHOWING ADVANTAGES OVER THE VULCANITE RETAINER*

By Ernest N. Bach, A.B., D.D.S., Toledo, Ohio

BEING a user of the Hawley vulcanite retainer for a few years, I have found it ideal in select cases with the exception of a few points to be discussed later.

It is not the purpose of this paper to discuss the merits of this type of retainer but to relate the construction data of the cast retainer, noting the advantages over the vulcanite. The cast retainer is practically a duplicate of the Hawley, the vulcanite being replaced with gold. Naturally, the bulk of the appliance is materially reduced, the thickness of the metal being 22 g.

The wire which passes buccally between the canine and first premolar very often breaks from the stress of the opposing teeth. This is easily soldered when the retainer is metal, but not so when made of vulcanite. Spring attachments may be added if desired, making it a working retainer.

It is easily cleaned and sterilized by boiling in acid.

Materials used are:

Kerr's Sheet Wax 22 g.
"Coe 4" Casting Gold for body of retainer. (Exceptionally stiff.)
0.022" round Spring Wire (any good make of spring wire).
16 k. Solder throughout.

THE CONSTRUCTION

Fig. 1 shows the finished retainer, the construction of which will be followed by description and slides.

A good plaster model, preferably from a plaster impression, is obtained of the case; the lingual surface of all teeth and palate very lightly greased with Nujol or Three-in-One oil. A piece of Kerr's 22 g. wax is laid over the model. A mark is made on the wax outlining the incisal edge of the incisors extending distally midway between the buccal and lingual cusps of the premolars and molars on either side to the lingual groove of the first molars.

The wax is removed and warmed, trimmed with shears to this line. This edge is parallel ¼" toward the median line with another line, the wax being cut on this line forming a U-shaped figure (Fig. 2). The wax is slightly warmed and pressed to place, being sure it is in contact with the lingual surfaces of all desired teeth. Cotton pliers with small pellet of cotton saturated in water and warmed in a flame may be used to adapt the wax to the interproximal spaces. When completely adapted, a groove is made in the wax at either side at the interproximal space between the canine and first premolar to receive the wire which passes buccally. When this wire is soldered to the

*Given before the First International Orthodontic Congress, New York City, August 16-20, 1926.

casting, it leaves a smooth surface at this point. The exposed surface of wax is washed with alcohol to remove the grease, then is given a heavy coat of painting, or regular investment material. This prevents distortion of the wax when removing (Fig. 3). Let dry thoroughly, remove, mount on a sprue, wash the tissue surface of the wax with alcohol, and paint with painting or regular investment. This is heated by any good method, dried, and cast with "Coe 4" casting gold. Fig. 4 shows rough casting. The casting is given the finished polish before any soldering is done, it being easier to do this without any attachments.

Fig. 1.—Shows the finished cast retainer.

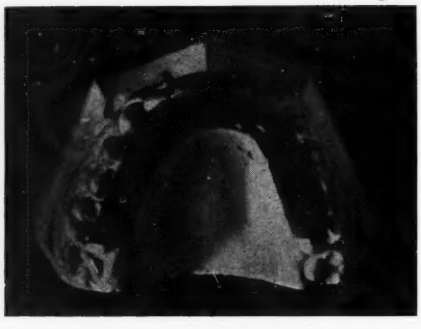


Fig. 2.—Shows the wax pattern cut in a plain "U" shape figure before adapting to place as shown in Fig. 3.

Fig. 3.—Wax adapted to gingival contour of desired teeth and soft tissues.

Fig. 4.—Shows the rough cast retainer. *A* indicates the groove for the insertion and soldering of the buccal wire.

The casting is now placed on the model, and if shrinkage has taken place, it can be adapted by heat, or split mesiodistally at the median line and soldered together with the lateral halves approximating the teeth. This being done, the casting is held in place by clamping with a heavy wire (12 g.) in the soldering stand. The wires which pass linguobuccally are soldered to the grooves on the casting and bent by heat, following the gingival outline of the buccal surface of either canines, the free end being cut near the incisal edge and connected with the same size wire over the incisors. The clamps are made of the same size wire and soldered as shown in Fig. 1 and also described by Dr. Hawley. Bite planes may be conveniently soldered to this type of retainer.

THE CARRYING OF ARTIFICIAL TEETH ATTACHED TO AN ORTHODONTIC APPLIANCE WHILE MOVING TEETH (CLINIC)*

By Dr. J. A. Cameron Hoggan, Richmond, Va.

FREQUENTLY you will find in your practice a case of delayed eruption of canines or incisors and since a gap in the denture at this point is a decided social inconvenience, the method described below rather easily overcomes the difficulty and pleases the patient very much. A simple device may be used where a bridge or some other artificial substitute exists at that point and must be removed during treatment:

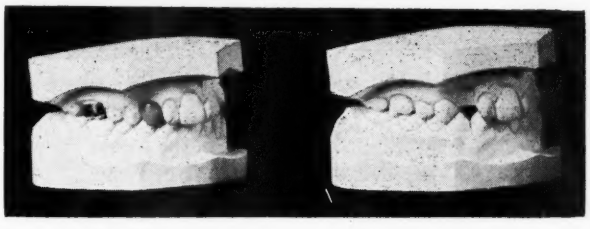


Fig. 1.

Fig. 2.

Fig. 3.

Bands are made for the molars and affixed to lingual base wire, nineteen (19) gauge gold and platinum, with a finger or fingers applying force to the teeth to be moved, while a short, heavy spur may carry an interchangeable facing, filling the space into which you are moving the tooth. Additional teeth may be carried at any other point on the arch at which missing teeth occur in the six (6) anterior teeth.

The case presented here (the patient is twenty-three years old) happens to be one in which there is an impacted canine on the maxillary right side and the lateral on the maxillary left side is in lingual occlusion. The crown of the canine was exposed and the space filled with an interchangeable facing (as seen in the figures) while waiting for it to come down. A finger spring of twenty-four (24) gauge wire was placed against the lingual of the left lateral to bring it to the correct alignment.

*Given before the First International Orthodontic Congress, New York City, August 16-20, 1926.

Case Reports

EXCESSIVE WIDTH OF MAXILLA, AN UNUSUAL CASE OF DISTOCLUSION WITH IMPACTION OF SECOND PREMOLARS (CASE REPORTS)*

By G. F. Cale Matthews, Birmingham, England

Case 1.—M. G., age twelve, November, 1917. (Figs. 1-3.)

Classification.—Unilateral Distoclusion: Angle's Class II; Division 1; Subdivision.

The excessive deformity allowed mastication only on the right side—notice the attrition of $\overline{21}|$.

No history of any habit.

Mouth breather.

Teeth good, except $\overline{6}\ |\ \overline{6}$ which were heavily filled with copper amalgam.

Treatment was devoted to expansion in the mandible, by ribbon arch, from November, 1917, to January, 1918, when intermaxillary traction was ap-

Fig. 1. Fig. 2.

Case. 1.

plied until August, 1918, when the lower ribbon arch was changed for a lingual arch with spurs on the anchor bands for the intermaxillary traction.

This treatment was continued until January, 1919, (thirteen months active treatment), which is the condition shown in the second models.

The child was not available for further treatment owing to school terms, and only occasional visits in the holidays. Retentive treatment until January, 1921, when a vulcanite plate with an inclined plane was inserted in the upper, to hold the mandible forward. This was only worn for a short time, and no further supervision has been possible.

*Given before the First International Orthodontic Congress, New York City, August 16-20, 1926.

The result attained was accomplished in thirteen months' active treatment (Fig. 4).

CASE 2.—G. A., age twelve, July, 1921. The first model is dated December of that year.

Bilateral Distoclusion, Angle's Class II, complicated by excessive width of the maxillae.

A. *B.* *C.*

Fig. 3.—Case 1. First models.

A. *B.* *C.*

Fig. 4.—Case 1. Result of thirteen months' treatment. Further active treatment impossible.

An expansion plate had been worn for the maxillary teeth, but no models to show the original condition before treatment was started. The dentures are complete with the exception of $\frac{3}{}$ | $\frac{}{3}$. Teeth well formed, free from caries.

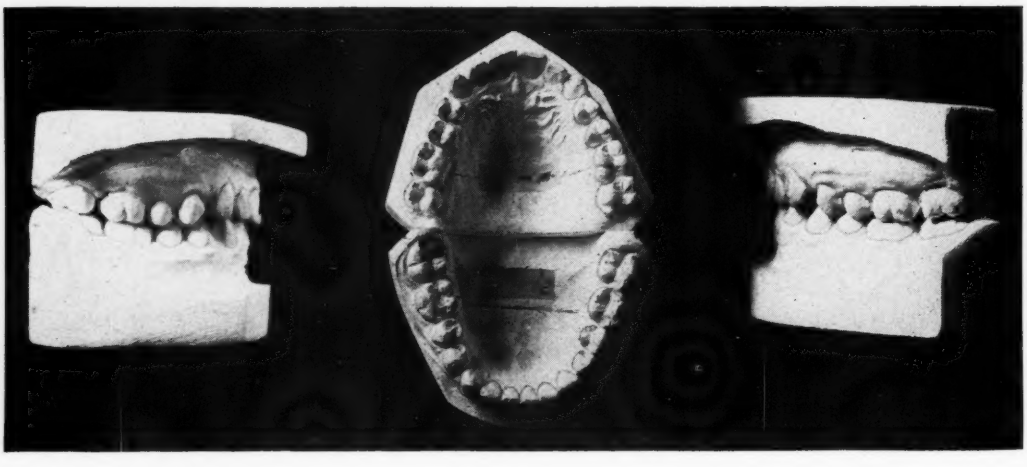
Actual measurements of the models brought with the patient at the first visit, and those taken in December, 1921, are identical. It will be seen that any attempt to articulate the models shows the width of a molar tooth in excess in the upper model. Actual measurement: maxillary 41 mm., mandibu-

lar 39 mm. The bite must have been one of convenience. Approximation of the models gives a distal occlusion of the first permanent molars. There is considerable spacing of the mandibular premolars.

Treatment commenced on December 22, 1921. The difficulty of school terms to be kept necessitated a type of appliance needing the least adjustment. Forward movement of the maxillary incisors seemed to be the first

A. *B.* *C.*

Fig. 5.—Case 2. First models. Note the excessive width of maxilla.



A. *B.* *C.*

Fig. 6.—Case 2. Final models. Treatment one year, seven months.

and most urgent movement; this would liberate the mandible, and if successful, would in that forward movement reduce the excessive width of approximation. Also a lateral pressure seemed to be necessary to narrow the posterior maxillary teeth. The distoclusion of the mandibular premolars due to the bite and the spacing had to be overcome. It was hoped that the eruption of the second permanent molars would have sufficient forward driving force to place the molars correctly mesiodistally provided the premolars were placed correctly. The overbite was approximately one-third excessive.

Ribbon arch molar bands were fixed on $\frac{6 \mid 6}{}$, bracket bands on $\frac{21 \mid 12}{}$ with a straight forward-driving force. The arch was sprung to exert contraction force on $\frac{6 \mid 6}{}$. The mandibular teeth were also treated with the same appliance, except that the incisors were left free. Bracket bands were placed on $\frac{54 \mid 45}{}$ with cleats soldered to the arch, and instructions given to work the arch forward by the sleeve nuts. This obviously maintained the molars in their original position and would not correct the distoclusion, but

A. *B.* *C.*

Fig. 7.—Case 3. First models.

A. *B.* *C.*

Fig. 8.—Case 3. Final models. Treatment four years, four months.

if the premolars could be carried forward to their proper position in one term, it was hoped the delay would not prejudice the normal eruption of $\frac{7 \mid 7}{}$, and that $\frac{54 \mid 45}{}$, once in position could easily be retained and $\frac{76 \mid 67}{}$ watched.

The technical difficulty of working this apparatus in the mandible proved too much for the patient, and a removable appliance was designed with interstitial spurs driving forward; the sharp-pointed occlusion rendered this a difficult movement, but eventually it was successful, but not until a bite plate had been worn for some time to reduce the overbite.

A simple inclined plane retention plate was worn in the upper, and a vulcanite plate in the lower, regularly for two terms, but this is now discarded and only used to prove that there is no movement of individual teeth. The corrected occlusion shows a reduction of 1 mm. in the maxilla, and 2 mm. in the mandible.

Appliances removed July, 1923.

CASE 3.—M. H., age ten. November 9, 1915. (Fig. 7.)

Classification.—Bilateral Distoclusion (Angle's Class II; Division 1). (Complication by supernumerary $\underline{3}\,|\,$.)

Treatment:

November, 1915. Expansion plate in upper.
(Supernumerary $\underline{3}\,|\,$ extracted.)

February, 1916. $\underline{6}\,|\,\underline{6}$ Anchor bands and retraction arch.

May, 1916. $\underline{6}\,|\,\underline{6}$ arch bands and intermaxillary traction.

Removed appliances March 23, 1920.

Note. Very small teeth.

Treatment, four years, four months (Fig. 8).

ORTHODONTIC TREATMENT FOLLOWING OPERATION FOR UNILATERAL ANKYLOSIS OF THE TEMPOROMAXILLARY ARTICULATION (CASE REPORT)*

BY DR. A. H. KETCHAM AND DR. WM. R. HUMPHREY, DENVER, COLO.

THIS case of a boy four years and six months of age at beginning of treatment, presents many interesting features, as treatment was started subsequent to operation on ankylosed left temporomaxillary articulation. A false articulation was established through an operation performed by Dr. Leonard Freeman of Denver. The following is Dr. Freeman's report:

"I operated upon the B——— boy, who was then three years and ten months old, on February 26, 1918, for ankylosis of the left temporomaxillary articulation. At that time he could open his mouth about one-eighth of an inch. The under jaw was undeveloped, the chin was receding. An x-ray picture showed the seat of the ankylosis.

"The ascending ramus on the left side was reached through a rectangular incision, one branch of which extended along the lower border of zygoma, and the other perpendicularly in front of the ear. The operation was difficult because of the deep situation and thickness of the bone, which was also increased in width and bent inwards. A channel was cut through the bone just beneath the obliterated joint and a flap of fascia turned in from the temporal region, so as to separate the ends of the fragments."

When the patient presented for orthodontic treatment, diagnosis dis-

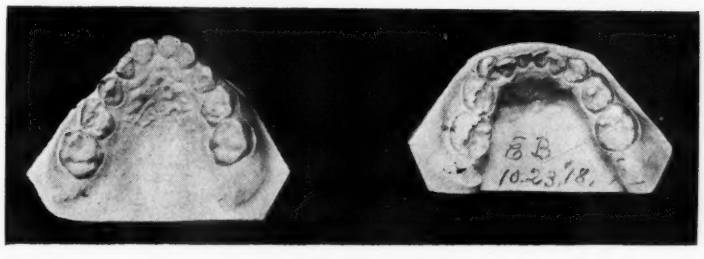
*Given before the First International Orthodontic Congress, New York City, August 16-20, 1926.

Fig. 1-*A*.

Fig. 1-*B*.

Fig. 1-*C*.

Fig. 1-*D*.



A. Fig. 2. *B*.

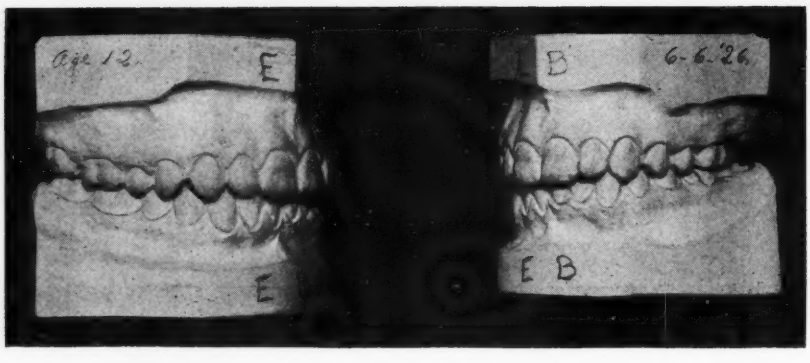
C. *D*. *E*.

Fig. 2.

closed all the characteristics of a mandibular distoclusion case, with extreme underdevelopment. Both arches are flattened on the right side, the mandibular incisors crowded and maxillary incisors protruding—Figs. 1 and 2. The mandible is shifted to the left and the teeth are also distal to a greater extent on this side than on the right. This may have been caused from shortening

Fig. 3.

A. Fig. 4. *B.*



C. Fig. 4. *D.*

of mandible due to ankylosis, also possibly from the abnormal function of the muscles. Fig. 3 shows a characteristic sleeping position which may also be a factor in causing the shifting of the mandible to the left, and to the flatness of the right side.

In treating the case, the Junior pin and tube appliance was used on maxillary and mandibular arches, the deciduous canines and second decidu-

ous molars being used for anchorage. Forward development of the mandible was secured through the use of intermaxillary ligatures.

January 14, 1922, the appliances were changed to the ribbon bracket appliance on both maxillary and mandibular arches, and the first permanent molars were used as anchorage. Intermaxillary anchorage was again used,

Fig. 5-*A*.

Fig. 5-*B*.

Fig. 5-*C*.

Fig. 5-*D*.

and during the last two years of treatment, further development of the mandible was secured by the use of a Hawley retaining plate, constructed with a sharp incline bite plane at its anterior border. The mandible was thus carried forward through function of the mandibular anterior teeth. Figs. 4 and 5 show the result of treatment on June 6, 1926. Function of jaws is normal.

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

BLEEDERS, BLEEDING AND MEANS TO CONTROL IT

By James L. Zemsky, D.D.S., New York, N. Y.

INTRODUCTION

BLEEDING in connection with oral operations should be very seriously considered; it is one of those grave complications of surgical procedure that causes much anxiety and at times even terminates in deep sadness. To a dental practitioner a loss of a patient due to mortality is disastrous; therefore, anything that can possibly be done in an effort to avert such calamities must not be neglected.

The following illustrates the situation by concrete examples taken from professional life: A young woman presented herself at the office of a dental practitioner for the purpose of having her bleeding gums treated, and several months later she died in a hospital from a case of chronic myeloid leucemia. While it may be a disputable question whether the treatment of spongy gums was responsible for her death through precipitation of a chronic case of leucemia into an acute process, in the minds of the noncritical public there was no doubt of the close relationship existing between the dental treatment instituted and the patient's death following it. As a direct result of such an attitude of the public the doctor's practice was ruined; he had to abandon the locality in which he lived many years, had built a lucrative practice, and was forced to seek a new section of the city where no one knew him and start from the beginning. An analysis of the situation showed when the patient went to have her gums treated she was already very sick, the spongy, bleeding gums being but one of the signs of her serious disease. She had suffered from leucemia, a type of disease that usually progresses far before the patient begins to feel that there is something wrong, the patient did not realize that she was seriously ill at the time she came to the dentist nor did the dentist, who treated her gums suspect this; he continued his treatments undisturbed until suddenly the crash came. Were the doctor not quite so *certain*

of the pyorrheic condition which had *persisted* in spite of his treatment; were he not taking things too much in a matter of fact fashion; and were he a little more suspicious of *cases that bleed persistently,* he would have most likely suggested to the patient to see her physician or else would have asked her to have her blood examined. The condition of the patient would thus be revealed and the unfortunate incident in his professional life could have been averted.

The other case is that of a young man twenty-four years of age, who came to a dentist complaining of a dull pain in the jaw. The doctor, having examined this patient's teeth, found a carious left mandibular premolar and extracted it. On the next day the patient returned to the doctor's office complaining of bleeding. The doctor found just a slight oozing from the socket and easily arrested it by inserting a tampon into the tooth socket. On the day following this, the patient came again complaining once more that on the night before he was bleeding. At this time there was no sign of any bleeding at all and the patient had been sent away. Early the following morning the patient appeared in the office again with the same complaint. Taking a glimpse in the mouth the doctor dismissed the patient instructing him "to forget it" and assuring him that everything would be all right. This was the last he saw of him. About a month later the patient died from an acute lymphatic leucemia. Here, probably, as in the first case, when the patient went to the dentist for relief of the pain in the jaws he had already developed symptoms of the disease from which he soon died, for often the beginning of this type of leucemia is accompanied with pain referable to the mouth and jaws. So, again, comes the question whether a case of chronic lymphatic leucemia was not precipitated into an acute process by the extraction of a tooth. However, if the doctor who extracted the tooth would have considered the case more seriously, and had more regard for *cases which persistently bleed,* he would have referred the patient to his physician in order to ascertain the physical condition; a diagnosis of lymphatic leucemia would have been made before the patient passed away and all the embarrassment could have been prevented.

Thus, from the above illustrations which may be augmented by many similar cases on record in literature, it may be observed that leucemias present a source of serious embarrassment to the dental practitioner. Whenever a patient shows a tendency to bleeding, the possibility of dealing with this or some other serious blood lesions must be considered. A very careful history must be obtained and a differential count of the white blood cells made. If the blood picture is positive, it may be either certain or suggestive of purpura, anemia or leucemia. A negative blood picture, however, does not positively exclude the possibility of presence of any of these lesions since in most clinical studies any one method of examination is not dependable.

All the patients suspected of suffering from diseases of the blood and hemopoietic organs require careful medical attention and should be referred to a physician as soon as such condition is suspected. As it was mentioned, leucemias are not the only blood diseases which terminate gravely for pa-

tients who are being operated upon without the knowledge of their condition. Purpura and anemias occupy a very important place in this class, a discussion of these lesions, however, in connection with the subject of this presentation is not practical for it would lengthen it to a degree making the publication of the article in a dental journal impossible. It will suffice to mention that the blood of patients who suffer from anemias, purpuras, leucemias and hemophilias had been so altered either through lack of certain ingredients or through the improper function of the blood-producing organs that it had lost its property to normally clot.

Excluding this type of patients, the handling of which requires the cooperation of medical men, the discussion shall now be directed to the practical methods of controlling bleeding in patients who do not suffer from any of the *serious* blood diseases.

CONTROL OF BLEEDING

Under this caption, several methods of *arresting* bleeding shall be presented. In considering the method of arresting hemorrhage the first and most important step is to determine what is the nature of the bleeding in the particular case. To accomplish it a systematic examination of the bleeding areas is necessary. Having thoroughly dried the surfaces covered by the blood, it is possible by careful observation to ascertain just where the hemorrhage comes from.

Is it a pulsating welling up of the blood from a socket of an extracted tooth? Is it a spurting jet of blood coming from an exposed bony surface or gum tissue? Is it a continuous capillary oozing from some point of the soft or bony structure, or is it a profuse hemorrhage from every surface that was cut, torn or lacerated?

Bleeding from a socket of an extracted tooth may not infrequently be caused by the presence in it of a diseased tissue (granuloma) and after the vascular, soft granulomatous structure is thoroughly curetted out, the hemorrhage usually ceases. When this fails, a strip of gauze impregnated with a 5 per cent iodoform solution should be inserted into the socket, a pad of sterilized gauze placed over it, and the teeth closed firmly together. In those cases in which the bleeding from a socket does not stop after the iodoform gauze has been inserted a tampon made of adrenalin chloride and packed firmly will usually check it.

A spurting suggests that a blood vessel had been cut; when this is found in a bone, the application of some blunt instrument over the bleeding spot and a slight blow delivered from a mallet upon it will usually arrest the flow of blood; when the blood vessel is in soft tissue it may be grasped with a hemostatic forceps and thus the tissues within which the blood vessel lies become compressed and the bleeding is checked. If, however, the bleeding still persists after the removal of the forceps, a ligature suture should be taken by passing a curved needle threaded with catgut or silk, through the tissues in which the bleeding vessel is situated, drawn tightly, and secured by a knot. A continued capillary oozing is usually controlled by local application of pressure, ice or cold water; more severe cases could be checked by

applying locally some foreign serum—in this connection hot water applied upon sponges proves very efficacious. To control excessive bleeding from soft structures in which no particular bleeding spots are discovered, a ligation of the tissues *en masse* by deep sutures should be resorted to. A wax prepared after Horsley's formula which consists of carbolic acid, 1 part, olive oil, 2 parts, and white wax, 7 parts, will be found very serviceable to control the bleeding from vessels situated in bony canals. Modeling compound or plaster of Paris may be used with an advantage in those cases of hemorrhage in which considerable compression of tissue is desired. After tampons or gauze packs are placed in position, the compound or the plaster is put over that and the patient is then instructed to firmly bite upon it. In very severe cases a bandage of the Barton type may be applied to insure the necessary pressure.

Profuse bleeding in normal individuals may sometimes be arrested by applying a rubber tubing around the thigh and fastening it there tightly. The object of it is to prevent the venous blood from circulating through the heart and thus decreasing the blood pressure. The tubing should be kept on until the legs get actually black and blue. The effect lasts from four to five hours which time may be utilized to some advantage; ligation of arteries, approximation of lips of the wound and suturing or a removal of the patient to a hospital. Those hemorrhages, however, which cannot be controlled by any of the above described methods are usually caused by the various blood diseases in which the coagulation of the blood is delayed.

Such types of hemorrhages require more drastic measures, among these ligation of one or more carotid arteries; blood transfusion or intravenous injection of sodium citrate are the most common. These operations, however, cannot be performed in the office and the patient who requires such procedures must be taken to a hospital.

PREVENTION OF BLEEDING

For patients with delayed coagulation of the blood which is caused by lack of calcium, an internal administration of calcium lactate for several days before the operation has been found very beneficial as it lessens the clotting time to almost one-half in many cases. Those cases which are not benefited by the administration of calcium are not cases in which calcium is the element lacking and in such instances other measures must be resorted to; these may be gelatin, in 2 per cent solution, repeatedly introduced by intravenous injections, ovarian and other organotherapy or subcutaneous or intravenous injection of animal serum.

The writer has found the last measure the most efficient, and therefore a detailed technic of this procedure is here given. Because the dental and oral surgeons usually operate standing in front of the patient and at its right side the *right* arm of the patient is the mast accessibe and convenient part of the body for the purpose of a subcutaneous injection. The sleeve is rolled up, the skin in the biceps region is washed off with a piece of gauze saturated with alcohol, and iodine is applied; then the skin is covered with a piece of sterile gauze. Into a 4 c.c. glass syringe, the needle of which is sterilized,

2 c.c. of hemostatic serum (Hemoplastin, Parke, Davis & Co.) is drawn up and then the syringe is filled up with Ringer (physiologic solution). Now the needle is again run over an alcohol flame, the piece of gauze covering the skin of the area to be injected removed, and the contents of the barrel are slowly injected, care having been taken to expel all the air from the syringe before the needle enters epidermis. After the solution is deposited, the needle is withdrawn and a piece of adhesive plaster is applied over the puncture, where it is held by a slight pressure with a pack of gauze. It is advisable to carefully remove with alcohol the iodine from the skin before the patient is dismissed. This injection is a very simple procedure and when followed step by step as above described, can be performed by any operator right at his office. To remove the patient for the purpose to a hospital, as some advocate, is absolutely unnecessary.

SUMMARY AND CONCLUSION

Patients whose history indicates a tendency to bleed or whose physical appearance suggests a feeble constitution must be handled with great care. Before any surgical procedure is attempted a blood examination should be obtained; this to include coagulation and bleeding time and a differential count. If the examination discloses that the case presents a blood dyscrasia the cooperation of a physician should be engaged. It ought to be borne in mind that loose teeth and bleeding, ulcerating gums do not in every instance mean pyorrhea; there are serious systemic disturbances which are accompanied by the symptoms in the mouth which may be easily confused with local oral lesions. When these conditions exist, it must be ascertained whether a surgical interference is permissible under the circumstances, for this may lead to a precipitation of a chronic low grade disease into an acute process—through lowering the resistance of the patient due to an unusually great strain which such patients undergo.

When bleeding is anticipated preventive measures must not be neglected. Calcium chloride or calcium lactate administered for several days previous to the operation or a subcutaneous injection of hemoplastin just before the operation is started gives very satisfactory results. Bleeding following operation must be very seriously considered; the cause should be determined whenever it is possible and all the measures available resorted to in an attempt to arrest it. Bleeding should not be trifled with, as such an attitude on the part of an operator usually leads to neglect of cases that require greatest attention; failure to do so not infrequently leads to loss of the patient's life—a catastrophe that at times might be prevented and therefore is most unpardonable and absolutely unjustifiable.

ABSTRACT OF
CURRENT LITERATURE

Covering Such Subjects as

ORTHODONTIA — ORAL SURGERY — SURGICAL ORTHODONTIA — DENTAL RADIOGRAPHY

It is the purpose of this JOURNAL to review so far as possible the most important literature as it appears in English and Foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Dental Aspects of Malignant Disease. F. W. E. Wagner (London). The Dental Surgeon, August 27, 1927, xxiv, 1190.

Malignancy and Its Relation to Dentistry. B. T. Simpson (Buffalo). The Dental Cosmos, August, 1927, lxix, 8.

By a coincidence these two papers appear at about the same time, the British author being an oral surgeon, while the American is associated with the State Institute (N. Y.) for the Study of Malignant Diseases. Wagner begins with an account of epulis, which is locally but not systemically malignant—a myeloma, not a myeloid sarcoma. While this lesion is chiefly associated with infected teeth, he has operated several times upon patients with edentulous jaws. Epithelioma of the gum is by no means rare and is also usually associated with chronically infected teeth. Epithelioma of the tongue, lip, tonsils, etc., although less closely related to dentistry than the two preceding, are carefully described. The article by Simpson is much longer and more exhaustive and is devoted largely to the present state of our general knowledge of cancer. Of special forms of malignancy which concern directly the dentist the author begins with the mixed salivary gland tumors and growths in the anthrum and follows with a section on malignancy of the oral cavity. Epithelioma of the gum and floor of the mouth may be due to badly fitting dentures. The author passes briefly over epulis and bone sarcoma to come to the so-called dentigerous tumors of Malassez which are described at some length. They assume a variety of clinical forms and may be roughly subdivided into dentigerous cysts, odontoma and adamantinoma, the last named being malignant although only feebly so—that is, they are of slow growth and do not metastasize although they recur readily after operation and terminate usually in death.

Significance of Salivary Calculus in the Development of Pyorrhea. C. Naeslund (Stockholm). Correspondenz-Blatt für Zahnaerzte, August, 1927, li, No. 8.

The author announces new viewpoints on this relationship as a result of exhaustive histologic, bacteriologic and experimental studies on the formation of concrements in the mouth and also on pyorrhea. Deposition of lime from saliva or pathologic exudates in preformed cavities including pockets

around the teeth is not the only source of calculus, for when these concrements form above the gum level they may also extend downwards below the gum, while various buccal microorganisms like the leptothrix are known to have the power to form calculi—that is, they form colonies and lime salts are deposited on them. Salivary calculus then is not to be visualized as a dead foreign body but as something with vital growth and even ability to form toxic material. The callus paves the way for microorganisms to penetrate beneath the gums and causes both mechanical and toxic lesions in the surrounding tissues and as a result paradentitis is seen which is none other than a stage of alveolar pyorrhea. However, the factors above cited are not the only ones to be considered although they represent, in the author's opinion, the essential cause, the others being only contributory factors. Although the author's paper is founded on original research he quotes from the writings of Americans, such as Flieschmann and Gottlieb, Brown, Goldberg and Head and Roos as giving sanction to certain aspects of his views.

Prophylactic Odontotomy, T. P. Hyatt (New York). The Journal of Dental Research, December, 1926, vi, 4.

As Dr. Hyatt's paper was read during 1925, its contents are now well known to reading dentists and have been noted in this abstract department but the very full discussion of the paper is probably not accessible to the average reader and is well worth notice. Bödecker opened the discussion with the statement that when the speaker first promulgated his views of prophylactic odontotomy they were more or less imperfectly understood, chiefly because the term "fissure" was wrongly interpreted. Lantern slides were here introduced to show the exact nature of a fissure. While Bödecker was at first skeptical the results of his independent research as shown in the slides has made him a convert to the Hyatt doctrine and practice. Cross of Boston announced himself warmly in favor of the same and expressed the conviction that if every dentist took up prophylactic odontotomy the amount of caries might in a score of years be reduced to about 5 per cent of what it is at present and that the practice of inlays and large fillings as well as root canal fillings might therefore become almost obsolete. Practically all loss of molars is due to fissures that were filled too late or not at all. Tracy of New York spoke of the opposition of various dental societies to Hyatt's teachings, the chief reason being that this prophylactic work could be construed as unethical, encouraging the unscrupulous to make fillings where fissures were absent. Time alone can correct this attitude. In closing the discussion Hyatt called attention to the fact that the audience comprised his best friends who were there to sustain his position. At some future time there may be legislation to compel those in charge of children to submit them to prophylactic odontotomy. In the meantime it would be best to encourage the expression of individual opinion as far as possible and not make a moral obligation of this phase of preventive dentistry.

The International Journal of Orthodontia, Oral Surgery and Radiography

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

Foreign Depots — *Great Britain* — Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single copies, 75 cents. To anywhere in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. Under foreign postage, $7.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, or registered letter payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—The publishers will communicate with authors regarding reprints upon publication of paper.

Communications—Contributed articles, illustrations, letters, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Doctor Martin Dewey, 17 Park Ave., New York City. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

Illustrations—Such halftones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements — Objectionable advertisements will not be accepted for publication in this Journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply is apt to be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter.

EDITORIALS

Malpractice Suits and Professional Insurance

THE desirability of insurance against malpractice suits has long been recognized. The importance of such insurance has been considered by medical and dental societies to such an extent that a great many state medical and dental societies are carrying malpractice and liability insurance under group policies. These so-called "blanket policies" are issued by different companies and it is generally necessary for a man to be a member of the state medical or dental society in order to obtain insurance under these group policies.

The purpose of offering group policies is to provide insurance to a group at a lower rate than it can be provided to the individual by the same or similar insurance companies. The fact that a medical or dental society ac-

cepts a group policy and practically makes a contract with some insurance company, virtually means that the medical or dental society has endorsed that particular company. A great many men have availed themselves of the reduced insurance rate, obtainable under these group policies, with the belief that they had liability protection and would be offered some relief in malpractice suits and other forms of legal involvement.

The average professional man subscribes to any group insurance policy that is endorsed by a medical or dental society without making himself familiar with the terms, specifications or benefits of this group policy. Most men believe that such a policy protects them against malpractice, error or mistake, and indemnifies them against loss or liability imposed by law upon the insured for damages. They also believe the policy states that the company agrees to defend them in the name and on the behalf of the insured in suit brought against the insured to enforce a claim whether groundless or not.

However, after a careful reading of a policy, and an interpretation which has been placed upon at least one policy by the attorneys for said company, we find the insurance company does not agree to "indemnify against loss or liability imposed by law upon the insured for damages, except such damages as are the result of bodily injury or death suffered by any person or persons in consequence of any malpractice, error or mistake." The majority of malpractice suits are not the result of bodily injury or death, and a great many times are not even the result of an error or mistake.

A large number of malpractice suits arise because of misunderstanding between the patient and dentist in regard to type or style of work which was to be done or the particular technic which has been employed in the performance of that professional service. A certain number of malpractice suits arise because the patient for some reason or other becomes dissatisfied with the type of work that is being done, and having paid for the professional services rendered, they sue to recover the money and instead of alleging malpractice, will file a suit under the heading "breach of contract." If a dentist should begin a piece of bridge work and the patient should pay a certain sum at the beginning of said work, and the dentist will have prepared cavities and made inlays for the construction of bridge work, the patient might decide he did not want bridge work involving the use of inlays; and therefore claim he was dissatisfied with the work done to date and bring suit to recover money paid and also allege malpractice, claiming the dentist was not following the proper technic.

If this suit were filed under the term "breach of contract," which would be a misnomer, the insurance companies issuing group policies with which we are familiar would not defend said suit; although their policy clearly states, "to indemnify against loss or liability imposed by law upon the insured for damages." However, we find they have modified that statement by adding "on account of bodily injury or death."

When a suit involves the preparing of cavities for inlays to be used in the construction of a bridge, and the patient desires some other form of work, it cannot be classed under the heading of "bodily injury or death."

Therefore, the dentist would not be protected even though he had paid insurance under this group policy for a number of years believing he was protected against malpractice suits; when as a matter of fact he was protected only against such suits as arise on account of "bodily injury or death."

We find at the present time it is the custom of certain lawyers to bring suits and counter suits against dentists under the heading of breach of contract, although the amount of money involved may be greater than the sum specified for the original or completed work, or a greater amount than had been paid up to the time this disagreement arose.

Regardless of the amount sued for or allegations made by the plaintiff, one insurance company to our knowledge has refused to defend said suit because it was filed under the term of "breach of contract." In this bill of particulars referred to, the plaintiff was also suing for money paid to a physician for medical services in the treating of the patient for infection produced as a result of dental work. This latter complaint was purely the result of bodily injury but the insurance company refused to have anything to do with the case because the attorneys for the plaintiff were wise enough to file the suit as a breach of contract. It was repeatedly called to the attention of the insurance company that the bill of particulars was in reality a suit for breach of contract and a tort. It was pointed out to them that owing to the fact that the plaintiff was suing to recover money paid for medical services made necessary by infection which was claimed to have resulted in injury to the patient, said insurance company should defend at least that portion of the suit dealing with the recovery of money paid for medical services. They flatly refused to do this.

We are willing to admit that, according to the policy referred to, the company was not called upon to defend breach of contract suits; but we do contend they should have defended suits regardless of what they were called when they were for the recovery of money paid for medical services, made necessary, as alleged by plaintiff, for infection produced while a patient of the insured.

It is our belief that the average professional man who carries liability insurance, whether in a group policy or individual policy, believes he is insured for all damages and against all malpractice suits regardless of how they arise or what they are called. It is our belief that the average practitioner would be willing to pay for a policy that would offer him that protection. While the majority of the present policies do not insure against breach of contract suits, however, the majority of such alleged breach of contract suits are misnomers and are filed as "nuisance suits." This term is applied to them because the dentist would rather contribute several hundred dollars to some lawyer than suffer any inconvenience of going to court and defending the breach of contract action.

Such breach of contract suits as have come to our attention have been misnomers based upon a false bill of particulars and will undoubtedly be successfully defended. However, since the average professional man desires to avoid the inconvenience of defending these suits, we believe he would be willing to pay an additional premium if he were fully covered against all

types of suits filed against him as the result of professional service rendered or supposed to have been rendered to patients.

The orthodontic profession is particularly annoyed by a type of suit resulting from misunderstanding arising during orthodontic treatment. A patient may contract to pay a definite sum of money for orthodontic services extending over a certain period of time. After a certain amount of money has been paid, the patient may decide that the work is not progressing as rapidly as it should, or he may become dissatisfied for some other reason—although the orthodontist and the service may not be at fault. The patient may decide to discontinue the case, and request the entire amount of money returned that had been paid up to date. However, if suit is filed and the patient alleges bodily injury, the insurance company will defend the insured. On the other hand, if suit is filed and called a breach of contract—although the dentist has fulfilled his contract up to date—the majority of insurance companies will not defend the suit.

Of course, such suits can be avoided or at least easily defeated if the orthodontist had an agreement with the patient whereby either party could discontinue orthodontic service at the end of any month, provided the full amount contracted for had been paid up to that date, and shall be considered full payment for services rendered. However, if the patient decides to discontinue, no money paid on contract should be refunded by the dentist or orthodontist. Such a contract would eliminate such malpractice suits as we have referred to, but they would still leave the dentist or orthodontist open to other suits for malpractice such as improper technic, caries produced by appliances, constitutional diseases occurring during period of treatment, and a vast number of other conditions which would not be termed by the insurance company as bodily injury.

We find a great many people believe teeth decay during orthodontic treatment, and parents are often prone to believe caries are the result of orthodontic appliances. Such caries are not bodily injury but are the result of action of microorganisms which do not produce a bodily injury, although they destroy the surfaces of the teeth.

Our purpose in calling attention to this lack of protection as found in the majority of liability policies is to create an interest among the medical and dental profession to such an extent that they will read the policy they now hold; and will probably be surprised to find they have not the protection they believe they have. A certain amount of protection may be obtained by having the patient agree to a carefully worded contract covering such things as mentioned above, before the work is started. However, a great many causes for malpractice suits arise which cannot be foreseen at the time the contract is signed and said malpractice will not be covered under the average liability policy.

It is our belief that the time has arrived when the medical and dental profession should demand a liability policy which protects them. It is the common practice of a large group of the legal profession who are aware that the present policies leave great loopholes, to file suits that the insurance companies will not defend. Liability insurance is a necessity but it should be a real protection.

FORUM

The Appliance Joker

IN THE columns of the Forum some months previous there was a report of the round table discussion pertaining to the laboratory-made orthodontic appliances. In this report there was set forth the attitude upon this question as embraced by some of the best minds in orthodontic practice in the United States. Men who have enjoyed years of experience in the active practice of orthodontia as a specialty, also men of long experience in general practice, added to the end-product of opinion.

Flaring up torchlike from various parts of the country, the laboratory appliance seems to come in for a great deal of discussion and criticism. What is to become of this proposition in the future will depend entirely upon the service rendered by laboratories who are devoting considerable time to the manufacture and selling of these appliances. Whether there is any merit in the whole idea, only time and time alone can tell.

There seems to be some current thought among specialists in orthodontia that the orthodontic laboratory properly run and maintaining a high grade service which will manufacture and create well-made orthodontic appliances according to the specifications, designs and plans of the orthodontist or general practitioner of dentistry, has a place within the laboratory realm of dentistry and should by all means be encouraged.

Unfortunately, however, many orthodontic laboratories propose in false propaganda ways and means of accomplishing a professional service to reverse the usual and general order of things and tell the operator what he should use, what it should be made of, and how it should be done. One laboratory, in fact, has only recently advertised a halftone portraying a case of malocclusion before and after treatment. The advertisement specifically states this case was treated by so-and-so laboratory's appliance in the hands of a general practitioner of dentistry. As a matter of fact the original cuts were procured from an orthodontic textbook published over twenty-five years ago and the case was treated by a specialist in orthodontia. A very definite and deliberate effort to deceive the dental profession has thereby been conceived and put into operation through advertising pages and if laboratories are to succeed they must refrain from making preposterous, misleading and amateurish statements in their advertising columns. They must offer a service of merit, a service which goes far beyond commercialism and the dragging into the dust of a high grade specialty of dentistry. They must remove their "clown suit" in some cases and offer a high grade service of merit, if they are to endure.

Even up to the present time there has developed a sharp difference in the character of laboratory service which is offered. One prevalent type is a sham, pure and simple, purported to be sailing under the cloak of science but in reality blundering along under the black flag of piracy. Made to sell, the welfare of the patient and dentist being a secondary consideration; fortunately, the day is usually saved for the dentist using this type of appliance, it being lost, strayed or stolen.

There is another laboratory service that has merit. It is that service based on the same foundation as all other departments of laboratory work in dentistry. That service willing to make an appliance according to the specifications and charts of the operator in charge and make no pretense of teaching the dental profession the intricacies of what is known to be probably the most exacting department of dentistry. This "blind leading of the blind" proposition can only endure as a temporary proposition. If the dental schools of this country have been unable to get the subject of orthodontia over to the dental profession in a satisfactory manner, how can a laboratory mechanic without a D.D.S. degree expect to do so by mail?

It is to be hoped the orthodontic laboratory "joker" will emerge from its present atmosphere of at least semi-quackery into a real service for the dental profession and for the specialist in orthodontia, that the propaganda drums beating for brass orthodontic appliances will cease for all time and devote their energy to the conscientious improvement of their art, that they will fold up their tent like the traditional Arab and withdraw from the field of orthodontic education, which is exactly where they do not belong.

Up to this time orthodontic training has been too big a problem for dental educational institutions throughout the land to handle and by this token the dental profession hardly expects the orthodontic appliance laboratories to handle this large order.

(*Signed*) OLD TIMER.

ORTHODONTIC NEWS AND NOTES

American Society of Orthodontists

Reports received by THE INTERNATIONAL JOURNAL OF ORTHODONTIA, ORAL SURGERY AND RADIOGRAPHY up to this time indicate a highly interesting meeting of the American Society of Orthodontists in Buffalo, April 30, May 1, 2 and 3, 1928. The president, Dr. Walter H. Ellis, obviously has his program organization well in hand. It is said there will be given this year two extremely outstanding papers by men of international standing and reputation on the subject of modern orthodontic appliances alone. It has also been reported that approximately one half day will be devoted to the round table discussions which were such a success during the last meeting of the American Society of Orthodontists held in Chicago. Round table discussions are informal discussions held at the luncheon tables and bring out some of the current as well as the latent orthodontic thought on various departments of this activity. The round table discussion this year will be in charge of Dr. Leuman Waugh, of New York City, and it is expected this will prove a highly interesting part of the program.

Buffalo, located as it is upon the international boundary line, offers many attractive features. Those who have charge of the meeting there have pointed out to those who have not been so fortunate as to have seen Niagara Falls on their honeymoon that this meeting can be made a second honeymoon, and a half day will be set aside for recreation and the viewing of Niagara Falls.

Southwestern Society of Orthodontists

The seventh annual meeting of the Southwestern Society of Orthodontists will be held at El Paso, Texas, December 5, 6, 7, and 8, 1927, at Hotel Paso del Norte.

A cordial invitation is extended to all ethical members of the dental and allied professions.

P. G. Spencer, Secretary, 1407 Amicable Building, Waco, Texas.

The First District Dental Society

The first District Dental Society, third *Better Dentistry Meeting,* will be held at the Hotel Pennsylvania, New York City, December 5, 6, and 7, 1927.

Notes of Interest

Dr. Norris C. Leonard announces his removal to Medical Arts Building, Baltimore, Maryland. Practice limited to orthodontia.

Dr. Sidney L. Tiblier announces the removal of his office to Suite 921-922 Canal Bank Building, Baronne and Common Streets, New Orleans, La.

Dr. A. LeRoy Johnson announces the opening of his office at 576 Fifth Avenue, New York City.

Dr. Landis H. Wirt announces the removal of his Miami office from 901 Congress Building to 1020 Olympia Building. Practice limited to orthodontia.

Dr. R. Burke Coomer announces the opening of his office November 1, 1927, 884 Starks Building, Louisville, Ky. Practice limited to orthodontia.

Dr. Bertram B. Machat announces the removal of his offices to the Medical Arts Building, 142-144 Joralemon Street, Brooklyn, N. Y. Maxillodental x-ray and surgery.

Dr. Earl Wildes Swinehard announces the removal of his offices to Suite 716-717 The Medical Arts Building, Cathedral and Richmond Streets, Baltimore, Maryland. Orthodontia exclusively.

Dr. Sidney Sorrin announces that after October 1, 1927, he will limit his practice exclusively to periodontia, x-ray and oral diagnosis. 269 West 72nd Street, New York City.

Erratum

Attention is called to an error in the advertisement of Cowden Specialty Company, page 13, October issue. The cuts of the Leonard Intermaxillary Device were reversed and give a false idea of the mechanical operation of the device. This error has been corrected in this issue of the journal, page 13.